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Farm Chemicals
Vol. 121 No. 7 JULY 1958
PIONEER JOURNAL OF THE INDUSTRY

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IN THIS ISSUE

▶ Partly because of the increasing expense of using surplus airplanes and aircraft companies' growing awareness of the market in agricultural flying, new specialized airplanes are becoming available to the aerial applicator. For a look at some of them and some comment on why they could be hard to sell, see **page 12.**

▶ The NPFI task force on off-season fertilization has made recommendations to develop the use of fertilizer in seasons other than the spring rush. They include applying fertilizer on alfalfa after each cutting, increased fertilizing of permanent bluegrass pasture, increased fertilization of fish ponds, more widespread adoption of the technique of side-dressing soybeans in midseason, and more fall fertilizing of rangeland. To find out what went on at the Institute convention last month, start reading on **page 19.**

▶ The June 23 decision by Federal District Court Judge Walter Bruchhausen in the "DDT Trial"—not to enjoin the government spraying of private property—has set a precedent favorable to large scale insect control and eradication programs. For the report and exclusive analysis by John Harms, see **page 28.**

▶ The complete report on fertilizer and plant nutrient consumption in the United States, released by the Fertilizer Investigations Research Branch of the U.S. Department of Agriculture, begins on **page 44.**

COVER PICTURE

The Transland Ag-2 Farm and Forest Airplane, built especially for aerial applicating. The basic design was influenced by research findings in the development of the Ag-1, the first airplane designed exlusively for agricultural use. (The Ag-1, first demonstrated in 1951, was built at Texas A&M College, and sponsored by the Civil Aeronautics Administration, U.S. Department of Agriculture, Texas A&M College and the National Flying Farmers Association.) Photo courtesy of Transland Aircraft.

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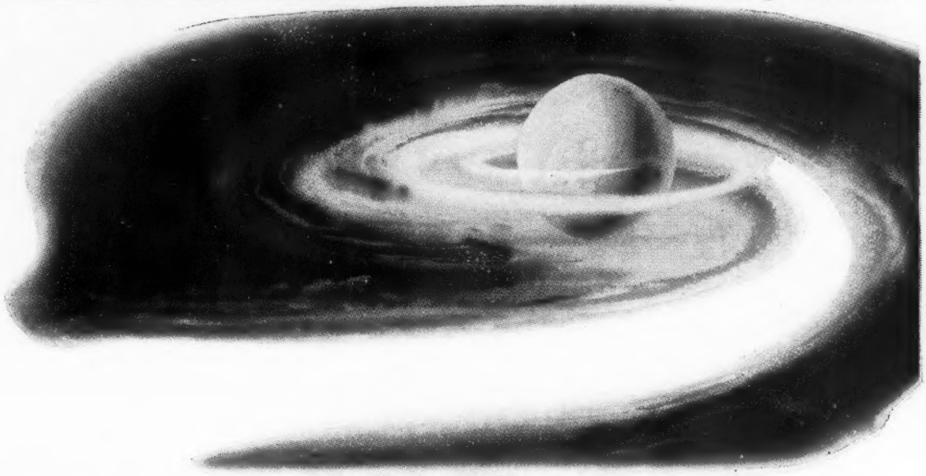

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VIEWING WASHINGTON

with Farm Chemicals Washington Bureau

on agriculture

Secretary Benson continues to ride high in the farm policy battle with the so-called "farm bloc." He pulled off what may turn out to be his greatest victory, in the closing days of June. The House Agriculture Committee had reported out its catch-all farm bill, vigorously opposed by the Secretary. At that point, while it looked like the bill would have tough going on the floor--there was little doubt in most observers' minds that the bill eventually would pass. But for all intents and purposes, the bill was killed before it got going on the floor. The question was on whether the House would take up the bill. Normally when the Rules Committee approves a bill for debate, the question of House consideration is routine. But this time the fight over the bill exploded immediately. As a result, the House voted 214 to 171 against even considering the bill. This amounted to a stunning blow to the farm bloc, and a large victory for Benson. The bill was defeated by a coalition of Republicans and "big city" Democrats who were aroused by charges the bill would boost bread and milk prices. Will major farm legislation eventually pass this year? The swift disposal of the House bill further strengthens our previous forecasts that little if any big changes in farm laws will be made this year. While Secretary Benson apparently has the strength to block any major bills he dislikes--he has not yet shown enough strength to push legislation through which he wants.

Benson's power shows up in the Senate. In another surprising development at press time, the Senate Agriculture Committee approved a bill which has received the Secretary's blessing. It goes a long way toward giving Benson much more discretion in setting price support levels and acre allotments for at least two major crops--cotton and rice. It also would terminate corn acre allotments, as he wants. While the Senate bill does not give him all he asks--it gives the Secretary much of what he wants on these crops.

Latest farm crop production surveys conducted by the Agriculture Department point to the possibility of another record crop year. First crop to be made, winter wheat, now definitely will be about 1.2 billion bushels--largest ever. Early growing conditions on feed grains, oilseeds and other crops herald bumper production. Cotton, after a slow start, appears to be catching up. Corn prospects are the best in years, with much of it shoulder-high in early July.

VIEWING WASHINGTON

agriculture continued

$12 million to be loaned to Greece for a new fertilizer plant. The Development Loan Fund has announced agreement to lend the Greek Government $12 million to help in establishing a nitrogenous fertilizer plant--one of the highest priority projects proposed under the new Five-Year Greek development plan.

The plant will utilize the lignite deposits being mined at Ptolemais in Northern Greece in one of the most underdeveloped areas of the country. It is expected to provide 1,000 jobs, save up to $15 million annually on imports, and provide low-cost plant food for Greek farmers.

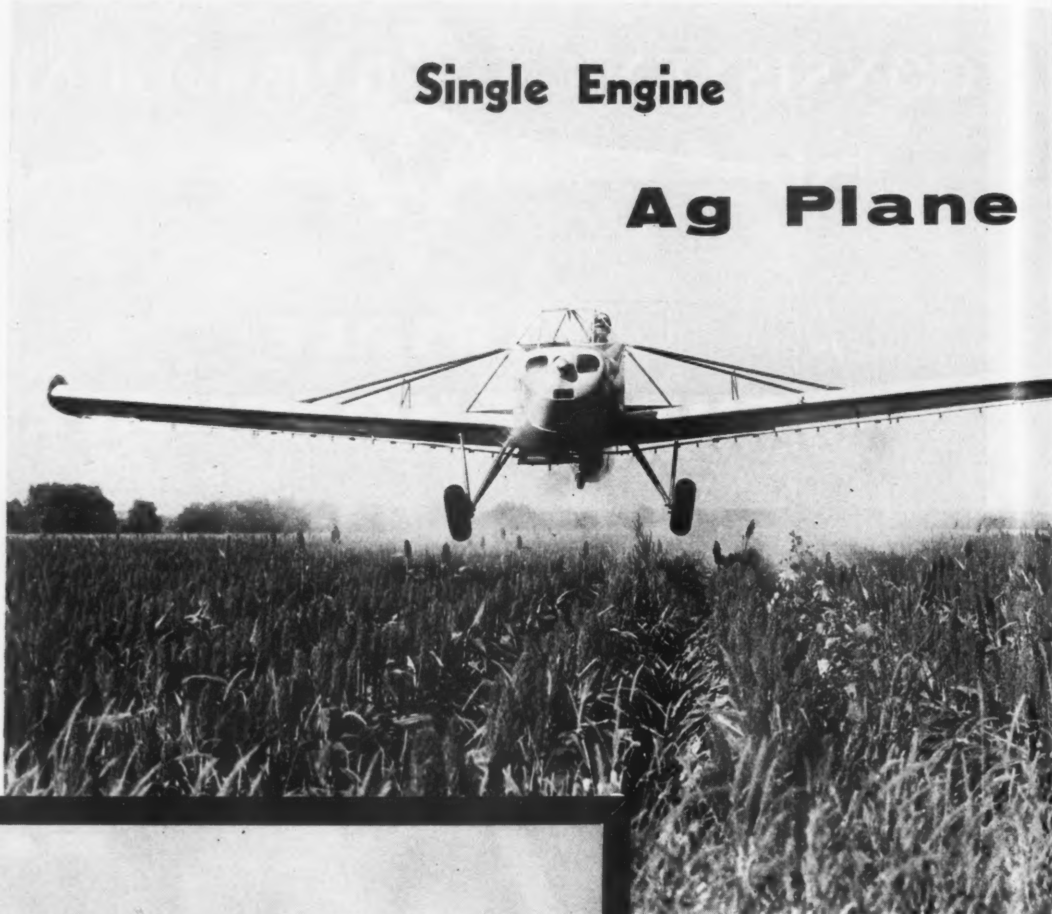
Estimated annual production of 75,000 tons of fixed nitrogen --or the equivalent of 300,000 tons of finished nitrogen-based fertilizers--is expected to meet Greece's immediate demands for this type of fertilizer. Production will include 25,000 tons each of ammonium sulfate and ammonium nitrate-cal; and 5,000 tons of liquid ammonia.

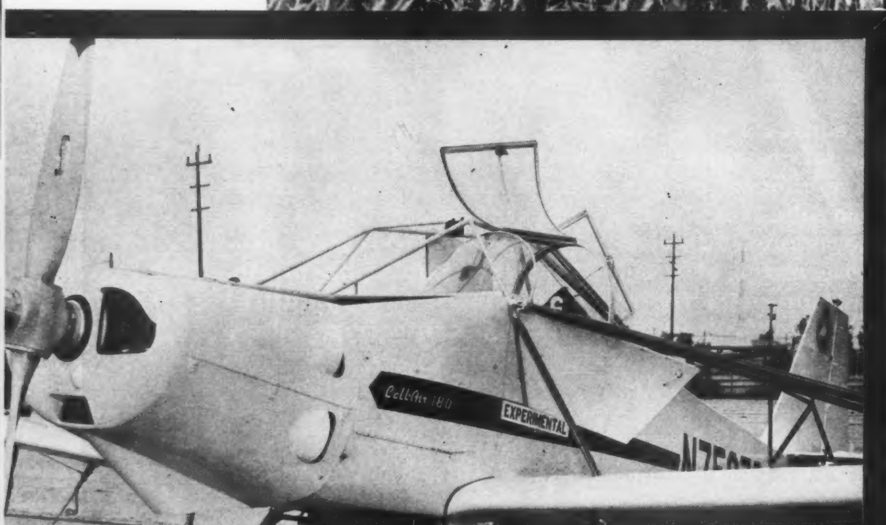
A potent new threat to soil conservation districts has erupted in South Dakota. One District, in East Corson County, has been voted out of existence by a farmer referendum, and others are under fire. Soil Conservation Service officials fear the drive may spread rapidly to other states, with other Districts getting tossed out. Several hot issues are involved, and intertwined. For one, supporters of the Agricultural Conservation Payment (ACP) program which is not run by SCS, fear the Administration aims to eventually kill off ACP. (The USDA pays farmers a share of the annual cost of fertilizer and lime applied to conservation land). For another, supporters of the county Agricultural Stabilization and Conservation Committees (which run most of USDA's programs in the field, including ACP), fear further downgrading in active responsibility of elected farmer committeemen. A third issue is the charge that Conservation District people overcharge for their services, which involve primarily provision of technical advice and other conservation services.

Grasshopper plague in western states poses the greatest threat in recent years, according to Agriculture Department experts. By the end of June, crop damage was not widespread, but the potential was for serious destruction if current measures did not succeed in cutting the 'hopper population. About 11 million acres are infested, one-third termed "critical." Parts of Colorado, Texas, Oklahoma, Kansas, and New Mexico are in this category. USDA helps pay part of the cost of spraying--about 1/3 when states and farmers cover 2/3 of the cost. Farmers must spray their own cropland at own expense. Recommended insecticides are aldrin, heptachlor and dieldrin.

Single Engine

Ag Plane





ABOVE. THE CALLAIR A-5 Agricultural Airplane, designed solely for the purpose of agricultural flying. The company, which makes only airplanes for agriculture, reports it has increased production "100 per cent over the previous year for the last three years to meet the growing demand. . ." Pilot safety is claimed as an outstanding feature. The A-5 has a 150 h.p. engine. Another model, the A-6, has a 180 h.p. engine.

LEFT. A CALLAIR experimental model.

Roundup

AERIAL applicating, begun experimentally in 1919, grew slowly in the following years. But explosive expansion followed World War II, when military pilots—trained for flying but with few other skills—turned to agricultural applicating for a living.

In 1957 almost 70 million acres of land were aerially dusted or sprayed with an estimated $150 million worth of chemicals, by over 4000 planes and helicopters.

The post-war combination of surplus pilots and equipment, plus suitable solutions and chemicals such as DDT, made the beginning of this expansion possible. Surplus Stearman Army trainers and N3N Navy trainers were being sold in the case for $250. Engines in carload quantities were selling for $15 each, and spare parts went for the price of freight.

Today, parts for these "workhorses of the air" are becoming harder to find. Rebuilt Pratt and Whitney 450 h.p. engines now cost about $3,000 and while new wings and tail assemblies are not impossible to find, they cost several hundred dollars.

Due partly to the increased expense of using surplus planes, and partly to a greater appreciation of

ABOVE. THE GRUMMAN AG-CAT. The first production model is scheduled to appear this summer. The biplane design is to provide maximum wing area with minimum wingspan (35'8"). Buyers will select the engine they need. Hopper volume is 29 cubic feet (217 gallons).

BELOW. THE PIPER PA-18A, with 150 h.p. engine and capacity of 110 gallons of spray or 18 cubic feet of dust. Minimum maintenance is claimed as an outstanding feature of this "most widely purchased agricultural airplane in the world."

THE TRANSLAND AG-2 Farm and Forest Airplane, with 600 h.p. engine, one ton payload, 53 cubic feet hopper volume, and 250 gallon liquid tank, was recently certificated by the Civil Aeronautics Administration.

the market potential in agricultural flying, some aircraft companies are making or thinking about planes designed for aerial applicating. (The Call-Air A-5, Transland Ag-2, and the Grumman Ag-Cat—all designed for agricultural applicating—are described in pictures and captions on these pages.)

Robert E. Monroe, assistant to the executive director of the National Aviation Trades Association, says that the ratio of large (Stearman, N3N) to small (Piper, Aeronca, CallAir) planes in agricultural applicating is probably close to 50-50 or weighted slightly toward small planes.

Which type of airplane is used is based upon two major considerations: 1. The amount of capital investment, and 2. The type of crop and what is to be done to it.

Monroe has explained that the presence of operators with old airplanes—who can always underbid on the cost per acre—makes it difficult for anyone to move into the field and successfully sell new agricultural aircraft. He pointed out that the "cheapest new ag airplanes cost around $6000. You can afford a lot of repairs, even at present parts prices, an old equipment for that figure."

He passed along the joke of the business—some airplanes have been wrecked and repaired so many times that only the nameplate is left from the original.

On certain crops with dense foliage, or when the underside of leaves must be covered, a low-wing airplane (either monoplane or biplane) is required to create the necessary turbulence in the air near the ground. On crops such as small grains, where turbulence is not necessary, high-wing airplanes such as the Piper are widely used.

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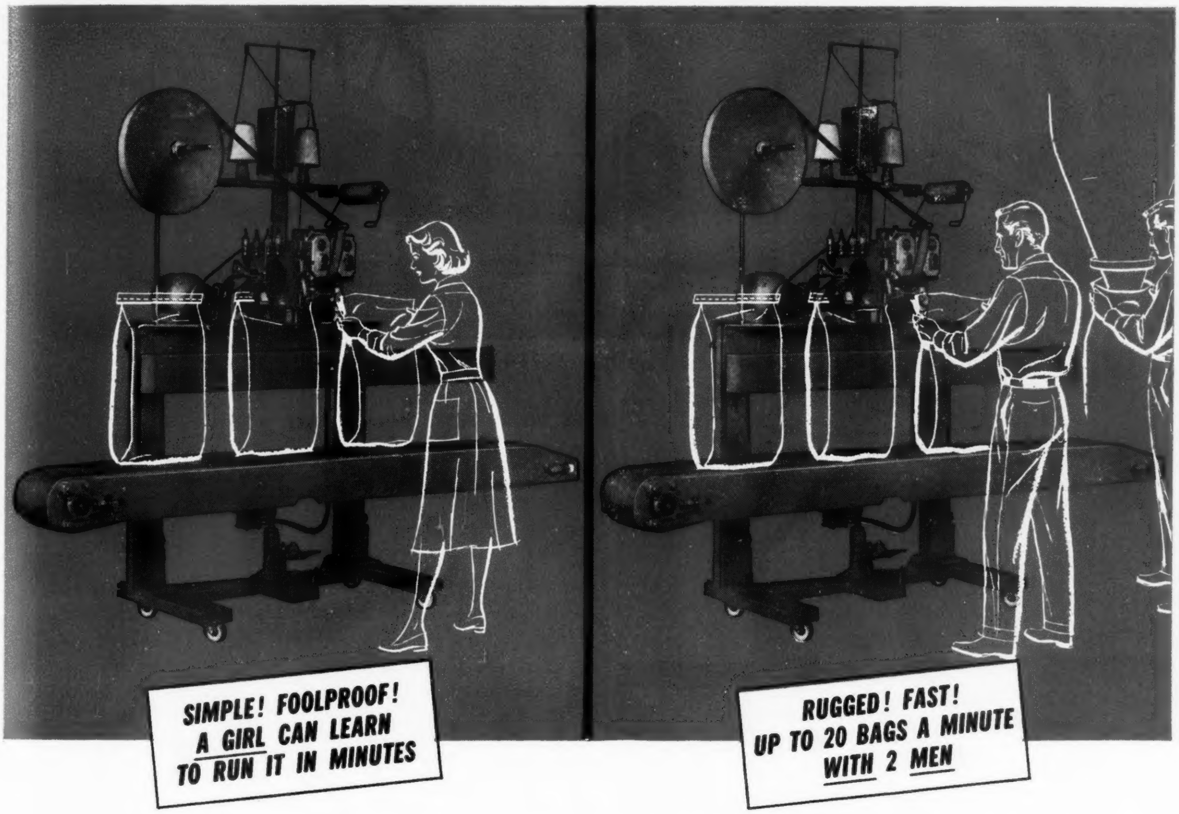

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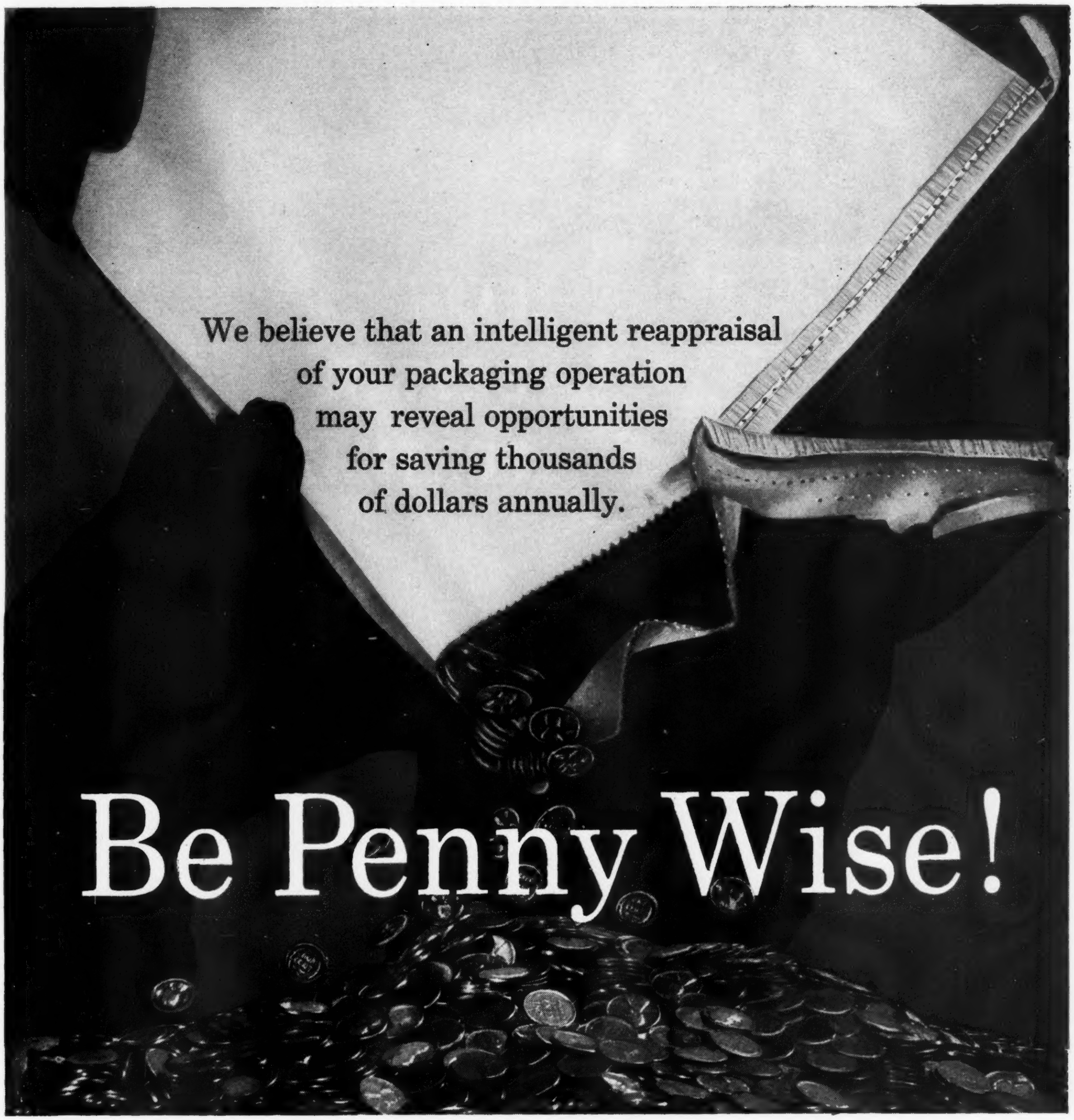
THREE VIEWS of the Stearman, often called the "workhorse of the air."

are other single-engine airplane models—both old and new—flying in the aerial applicating business. These include the Clark Model 1000 Ag-Biplane (developed along the lines of the Stearman), the Aeronca (the company no longer makes airplanes), the Taylorcraft, the Travelair, the Champion, the Rawdon, the Snow S-2 and the Lanson Airtractor.

Cessna Aircraft Company has reported experimental work on the Model 305A, "basically the same airplane" as its L-19 military plane, but there are no plans to produce the craft for aerial applicating in the near future. ▲

BELOW. The new "Swathmaster" dispensing unit for dust, spray, seeds and fertilizer installed on a Stearman. Built by Transland Aircraft, it went into full production last month. Adjustable swath widths of 33 feet to 100 feet are claimed.



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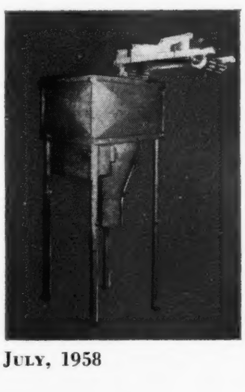

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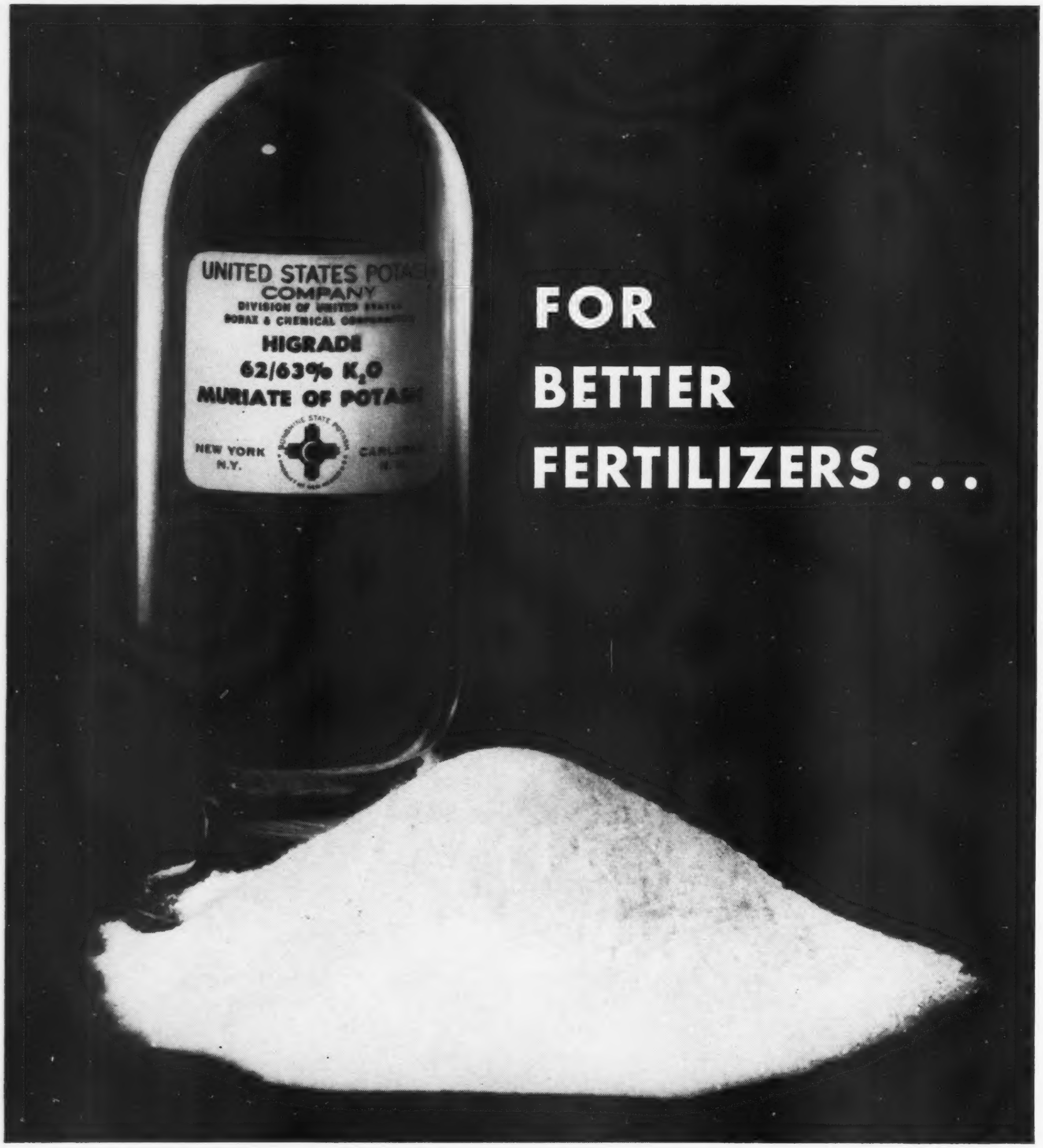

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✓ Farmers' *Attitudes* Toward Fertilizer

✓ Farmers' Fertilizer *Practices*

HOW CAN WE CHANGE THEM?

SOIL testing and farm demonstrations were advocated most as specific steps to change the ways of the farmer with fertilizer, during scheduled sessions at the National Plant Food Institute third annual convention last month.

The two old reliables cropped up most frequently in the discussions that brought forth from men—in and out of the fertilizer trade—their thinking on ways to employ research, education and promotion in persuading farmers to use fertilizer at most profitable rates.

Dr. Moyle S. Williams, NPFI's chief agricultural economist, led off the panel on changing farmers' attitudes by unveiling an exhibit.

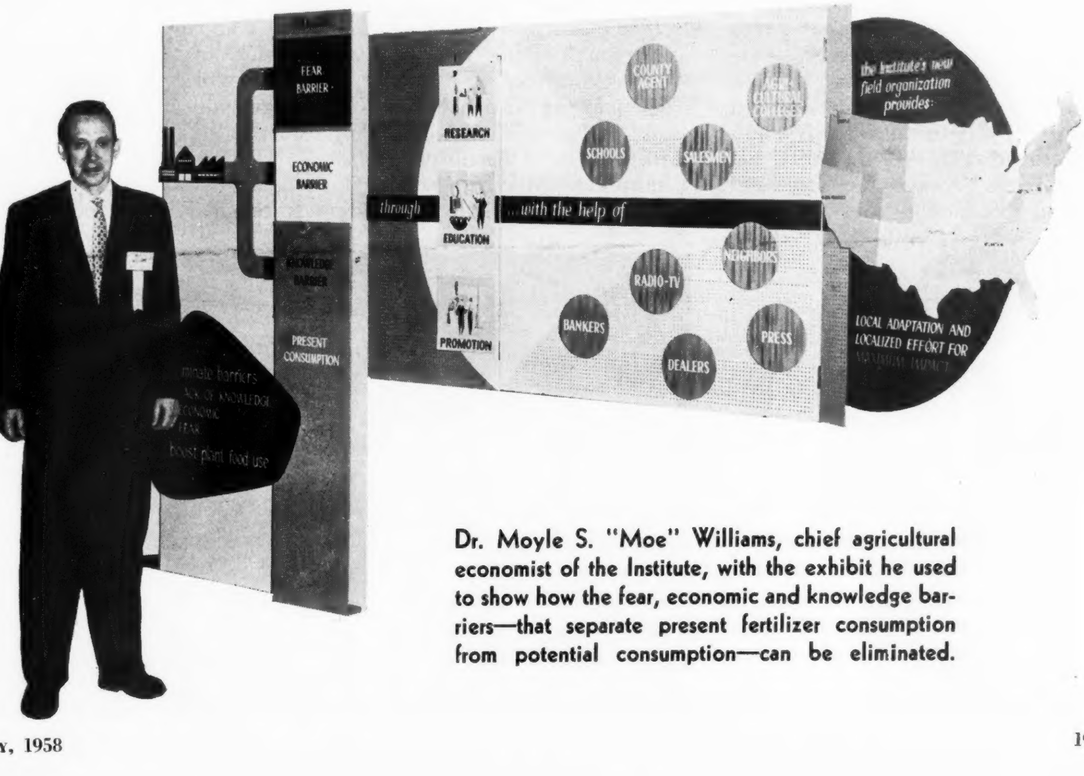
Dr. Webster Pendergrass, dean of agriculture at the University of Tennessee, outlined his recommendations for colleges to improve their effectiveness in obtaining more widespread and efficient use of fertilizers by farmers.

What Colleges Can Do

He said they should: 1. prepare information that is tailored to fit local situations; 2. use all available means of mass communications; 3. "expand group efforts;" 4. provide individual counseling; 5. work with industry on fertilizer demonstrations; and 6. adapt soil fertility information and activities for youth programs.

"Training meetings should go much farther than the farmer," he said. He added, "I do not believe that the average county agent today has the knowledge he really needs . . . in soil fertility . . . to help the farmers."

Dr. Pendergrass said that colleges should continue with demonstrations, "but involve in them the trade, other agricultural agencies, farm organizations and



Dr. Moyle S. "Moe" Williams, chief agricultural economist of the Institute, with the exhibit he used to show how the fear, economic and knowledge barriers—that separate present fertilizer consumption from potential consumption—can be eliminated.

Outgoing Institute President John A. Miller, Price Chemical Co., (right) introduces "Changing Farmers' Fertilizer Attitudes" panel. Left to right: Williams, Pendergrass, McGuirk.

many more farmers." He said there was little doubt that the use of fertilizer in a practical manner would be increased if there were enough trained workers available to explain soil testing, assist with sampling, and adapt recommendations to specific crop and field conditions.

Emphasizing that "the farmers of tomorrow" should be considered in any educational effort, Dr. Pendergrass said that youth group members can serve as excellent demonstrators. "Their usefulness in this connection can be greatly enhanced if such demonstrations include all practices necessary to successful crop production and not just fertilization."

What Industry Can Do

After hearing what colleges could do, W. E. McGuirk, Jr., president of Davison Chemical Company, told the convention what industry could do. "We have a product that can do a job for the farmer," he said, adding that the plant food industry has "a solid story of the contribution fertilizer can make." He spoke as chairman of the NPFI special study committee.

He said the National Analysts study of Farmers' Attitudes Toward the Use of Fertilizer (Farm Chemicals, March) "seems to indicate that our individual advertising efforts have measurably failed, witness the fact that over 50 per cent of the farmers do not even understand the terms used to describe fertilizer, much less how the use of fertilizer can make money for them."

Profit Cutting

McGuirk estimated that the fertilizer industry capacity is about twice current usage, and that this season there would be a seven per cent drop in tonnage consumption since 1957. He said that the inevitable result is a cutting of profit margins, pointing out that for a ton of 10-10-10 in Indiana, the 1953 price was \$70. This year that price has dropped to \$61.50, he said. "Manufacturing improvements are needed to keep us healthy," he added.

"The present effort to simply move more tonnage has created some very strange and unhealthy situations," he said. As an example, he described the grade policy of Ohio, where there are 69 fertilizer grades. Ten grades, representing five ratios, made up 99.5 per cent of the sales, he reported.

Emphasizing that he thought the time had come for changes, McGuirk pointed out that "no one company has the funds to put on an advertising and sales promotion campaign of the magnitude needed for our industry."

"The only alternative," he continued, "is to devise, through the National Plant Food Institute,

Left: McGuirk

Right: Pendergrass tells joke.

an intensive joint education, advertising, and sales promotion program." He urged that after the cost is determined, "we must contribute on a tonnage basis to carry our message to that uninformed and untapped 50 per cent of the nation's farmers." He suggested that the industry look on such a program as a way to spend advertising dollars more effectively, rather than just an increase in advertising expense.

This "massive communications job" would either succeed or fail, depending upon how interested NPFI members "and others in the fertilizer industry" would be, McGuirk claimed. He suggested that immediate steps be taken "to determine those who are willing to contribute—preferably on a continuing basis."

Budget For Program

"If those representing 75 per cent of the tonnage production show interest, the staff of NPFI should then work out a proposal and budget that could be taken to both members of NPFI and nonmembers for positive action," he recommended.

After mentioning the success of various trade organizations in reversing declining consumption—including the American Dairy Association and the Lumber Manufacturers Association—McGuirk suggested that "a committee be named to explore the possibility and budget of a promotional program and bring their recommendations before this membership at the earliest possible moment."

At press time, no report had been received of progress along these lines.

"Changing Farmers' Fertilizer Practices" panel in action. Left to right: Moderator A. H. Bowers of Swift & Co., dealer Buerge, county agent Clark, banker Rash.

To show what NPFI is doing, W. Raoul Allstetter, vice president of the Institute, introduced the regional representatives and directors, who he said would describe part of their work.

Fertilizer And Weather

Dr. Richard B. Bahme, district representative at San Francisco, who commented that the regional officers act as catalysts between agricultural leaders and farmers, stressed that fertilizer is important in helping the farmer fight bad weather.

He said research on fertilizing ranges "where moisture is restricted to natural rainfall in arid areas of the west, already indicates how fertilizer improves water use and greater forage."

Plant growth at low temperatures—when nutrients may become limiting—may be improved by fertilizer, he said.

Zenas H. Beers, district director at Chicago, explaining that lack of motivation keeps many farmers at low crop producing levels, said a "Crop Production Potentials" program has been started (FARM CHEMICALS, March). The program is designed to supply information to help make more profit for the farmer, convince him that a better crop producing job is possible on his farm, and, of course, sell more fertilizer.

Reasonable Crop Potentials

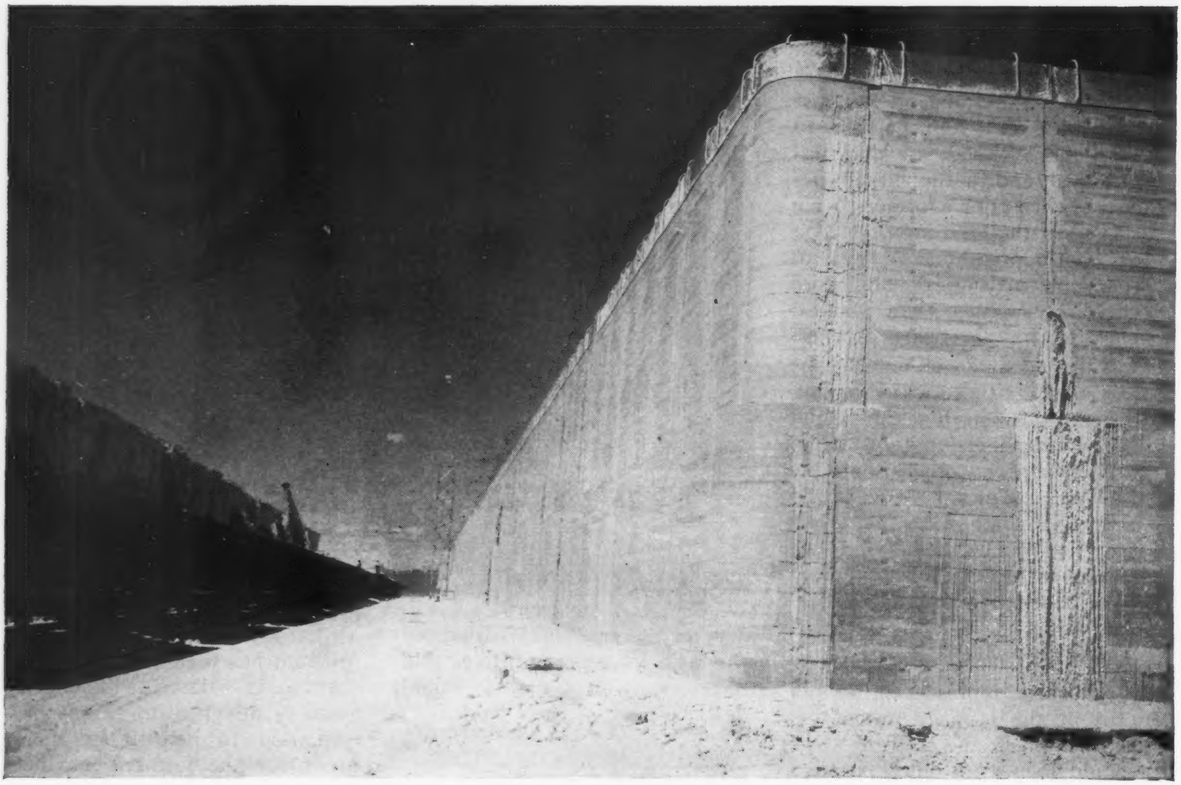
The crop potentials are reasonable goals, attainable by nine out of ten farmers in a given area according to the college specialists who have established them, Beers said.

Dr. Samuel L. Tisdale, southeastern regional director, said that effectively encouraged soil tests could double fertilizer sales in most southeastern states. He pointed out that members in "some areas, notably Florida," have doubted the value of current

(continued on page 24)




Four who helped tell what the Institute is doing to change farmers' fertilizer attitudes. Left to right: Beacher, Garman, Tremblay, and Allstetter.



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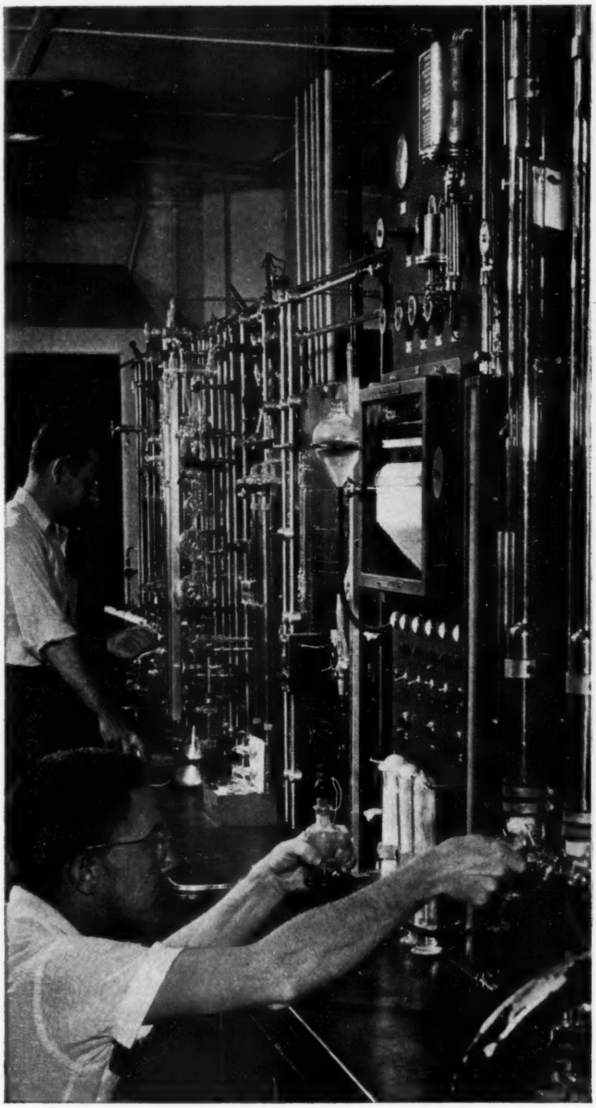
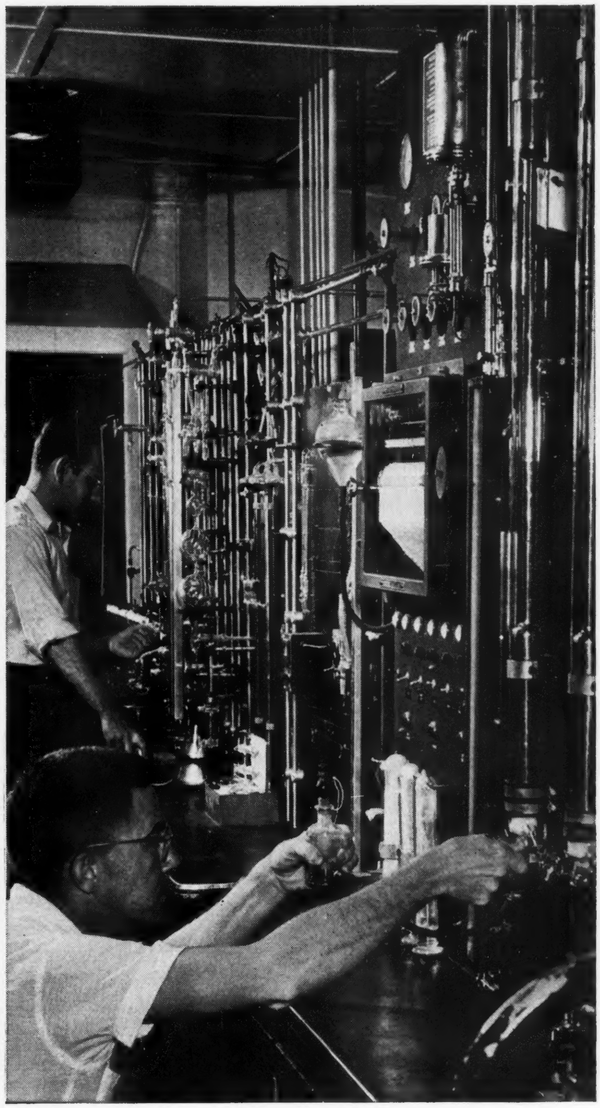
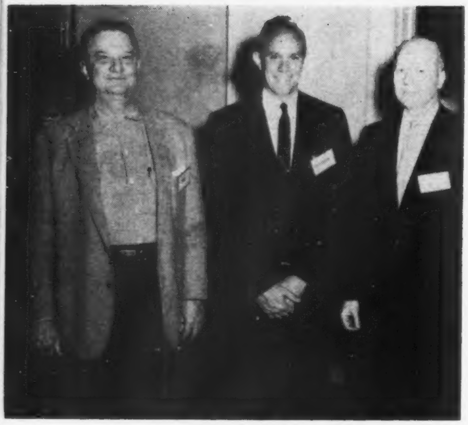






Left to right: Cliff Camp, Nitrogen Div.; Al Dickinson, Freeport Sulphur Co.; Loy Everett, Commercial Solvents Corp.

Left to right: Dr. H. B. Mann, American Potash Institute; J. Robert Mell, Potash Co. of America; Murray C. McJunkin, U. S. Steel Corp.

(from page 21)
soil testing procedures, and he excluded Florida from his discussion.

"Estimated fertilizer needs in the southeast are great, and these estimates are realistic," he said. "The tonnages recommended are those known to be needed for a grower to get the greatest net income from his farming operation," he added. The way to move these tonnages, Tisdale said, is a sound soil testing program, a technique he said has been shown to be effective in increasing fertilizer use. "We plan accordingly to increase our support of soil testing," he announced, and outlined plans for working with extension officials.

Credit And Soil Tests

Soil testing was also recommended by Dr. Willard H. Garman, northeast regional director, who said it is the most practical tool for farmers to use in obtaining the greatest returns on a dollar invested in fertilizer. "However," he said, "soil testing is no better than its practical application on the farm, and unless more farmers use soil tests and follow the recommendations, farm income in most states will remain at low levels in comparison with where it should be."

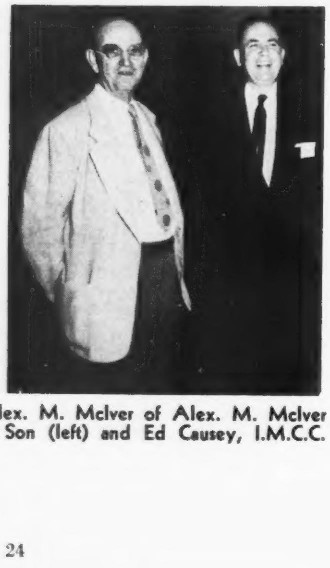
Dr. Robert L. Beacher, director at Fayetteville, Ark., said that "farm fertility demonstrations are playing an increasingly important role in getting more farmers to use fertilizer at recommended levels. . ."

He said the Institute is providing demonstration programs, cartoon mats for papers, radio and television productions, sound-color films on demonstrations and magazine feature articles "to give other states the benefit of the effectiveness of the demonstration approach in the field of soil fertility."

Forest Fertilizing

F. Todd Tremblay, representative at Seattle, narrated a color motion picture on forest fertilization in the northwest, and told the convention that "tree fertilization studies in the northwest are in their infancy. Preliminary studies however, indicate that fertilizers may be a prime factor in enabling foresters to carry out proper management practices. The expanded program of the Institute in the Pacific Northwest is aimed at helping to promote the proper use of fertilizers on these and other crops as determined by research and extension personnel in the area."

Tremblay said that while it is necessary to make practical use of the knowledge already accumulated, "additional research is needed on fertilizer use throughout the area." He reported that "much more research is needed on rates, ratios, and placement of fertilizer on all the crops grown in



Alex. M. McIver of Alex. M. McIver & Son (left) and Ed Causey, I.M.C.C.

John Ott introduces his time-lapse movie, "Watching Fertilizer Work."

the irrigated areas throughout the west."

He said the Institute is interested in sponsoring research projects to develop the needed information, and also wants to help evaluate results from an economic viewpoint and get the "data out where it can be used by the farmers in the northwest."

A Dealer on Changing Farmers

That afternoon, a panel of three took up the problem of changing farmers' fertilizer practices. Orville Buerge, a dealer from Harrisonville, Mo., put in many good words for soil testing. He cited "instances in our trade territory where bankers have loaned money for the purchase of fertilizer in accordance with soil test recommendations. These farmers paid off their notes in the fall of the year. The same bankers loaned money to farmers to purchase just a small amount of fertilizer which was not in accordance with any soil test recommendations, the results were that these farmers were not able to pay off the notes, and they requested that the notes be renewed. . . . There is no question in my mind, that if this soil testing were encouraged by all concerned, the results would be that the sale of fertilizer would be increased tremendously."

He also advocated that farmers use "fertilizer check strips" on their farms, pointing out that they could get information from them that they could not find any other way.

A County Agent on Dealers

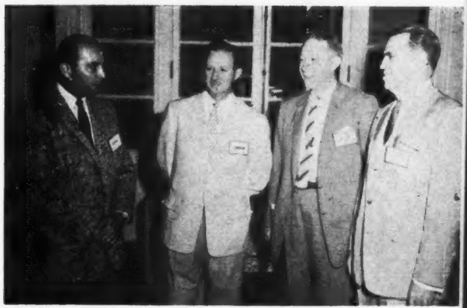
J. W. Clark, county agent from Madison, Dane County, Wisc., declared that the farmer "has to depend on somebody else than the county agent to help him guess about fertilizer needs. That someone else has to be at the decision point and I say that's the dealer. There is a mutual responsibility between the fertilizer dealer and the county agent."

Clark said soil tests do not always "tell you all you need to know." He pointed out that the analysis may not be representative of the entire field. He said the recommendation is only a guess, with or without a soil test, although it may be a better guess—an intelligent guess—with the soil test. The test is valuable chiefly for its psychological effect and as a guide to kind and amount of fertilizer to use, he said. Some of the audience did not like Clark's use of the word "guess"—they preferred measure or estimate—but Clark stuck to it.

Good Demonstrations

He said that if he found two demonstrations out of ten that were good, he'd be very pleased. By "good" he meant capable of serving the ends of extension workers and the fertilizer trade. He emphasized that a demonstra-

(continued on page 27)



Left to right: Jordan Thorne, Grand River Chem. Div. of Deere & Co.; W. L. Garman, The Best Fertilizers Co.; John R. "Dugan" Taylor, Grand River Chem. Div. of Deere & Co.; Lowell W. Berry, The Best Fertilizers Co.

J. W. Harrell, Southwest Potash Corp. (left) and J. J. Devlin, Southwest Potash Corp.

Left to right: Thomas W. Childs, Southwest Potash Corp.; Kenneth D. Jacob, U. S. Department of Agriculture; James A. Barr; Dr. Harold H. Shepard, U. S. Department of Agriculture.

Fred C. Scribner, Jr., Under Secretary of the Treasury, talks about the national economy.

ABOVE. L. to R.: Paul T. Truitt, executive vice president; L. Dudley George of Richmond Guano Co., newly elected chairman of the Board of Directors; Richard E. Bennett of Farm Fertilizers, Inc., newly elected president; and Dr. Russell Coleman, executive vice president.

RIGHT. Some happy members at the annual banquet.

(from page 25)

tion must have contrast and drama for visual impact to convince the farmer.

Clark explained that "most farmers never have the opportunity to consult the local county agent when fertilizer decisions are made. A few farmers know the agent well enough to talk with him personally. . . . But even if every farmer knew the agent well or was inclined to visit him for private consultation, the agent couldn't take care of him. In my county . . . there are 5,000 farms. These farms probably average 12 fields apiece—60,000 in all. There are six men on our staff. In a single year's time we couldn't possibly advise about all these fields."

"I'm confident that farmers generally respect both research and educators," Clark continued. "They are exposed to a great deal of the type of education that gives them faith in colleges, county agents, and applied research. Unfortunately, most farmers are not able to hire trained technicians who can test their soils and advise on fertilizer problems at the decision point—where what and how much is decided."

Harry E. Rash, president of the First National Bank in Thayer, Kans., announced that his bank never refused to make a fertilizer loan, and never had a loss on a fertilizer loan.

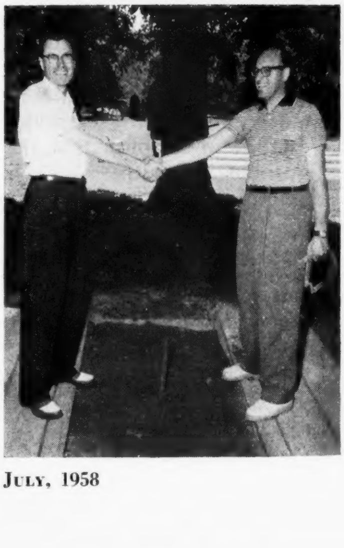
Fertilizer Loans and Income

"In 1954, we hired the first farm representative in our area," Rash said. "We regarded a sound fertilizer program as one of the

(continued on page 62)

An impromptu bit of stylish whimsy by Mrs. F. H. Kennedy and C. E. Martin.

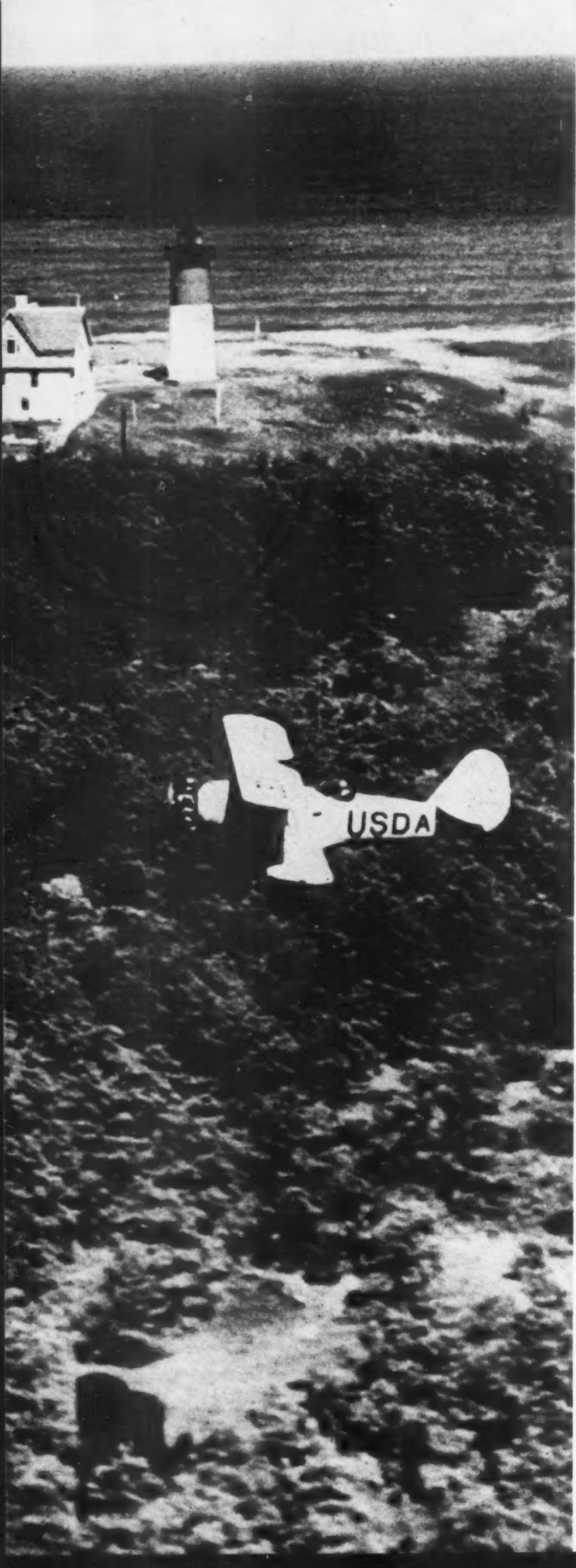
Paul Schafer (left), American Cyanamid Co., winner of the horseshoe singles; and Gordon Berg, FARM CHEMICALS, runnerup.



Joe Whittington, Olin Mathieson Chem. Corp., entertains the gallery.

Quentin S. Lee (left), Cotton Producers Assoc., and Victor A. Ericson, Consolidated Rendering Co., winners of horseshoe doubles.

Legal Horizon Clears for spraying



BY JOHN HARMS

THE RECENT court decision clearing government mass spraying of DDT on Long Island of alleged threats to health, property and wildlife goes far beyond the immediate issue.

The June 23, 1958 decision of District Court Judge Walter Bruchhausen in Civil Action No. 17610—the widely-publicized "DDT Trial"—is a major contribution to the developing body of law concerning the rapidly growing insecticide industry. It is the basic decision to which all other similar legal questions will be referred.

Some of the historic consequences of the Bruchhausen decision are these:

- It amounts to legal endorsement, for the first time, of the principle of mass insecticide spraying on the basis of the common good, and terms it "the proper exercise of the police power."*
- It provides a new built-in protective device in future court actions brought against mass insecticide spraying operations.
- It amounts to court approval of, and apparent confidence in, the methods developed by the U.S. Department of Agriculture in the operation of spraying programs.

What the decision *does not do* is equally important. For example, in regard specifically to DDT—the decision does not attempt to make a judgment on whether the insecticide really is or may become harmful. It merely says that no proof has been presented to the court that the *program under question* has been harmful.

Judge Bruchhausen observes: "DDT has not been in use for a sufficient length of time to definitely evaluate its potentials . . . there are very few experts possessing the requisite broad and intensive experience with this pesticide."

Here are excerpts of the Bruchhausen opinion on major issues involved:

DDT effect on human health.

"Although the plaintiffs contend that the chemical is deleterious to health and likely to cause future ailments, they presented no evidence that they or anyone else were made ill by the spraying of DDT in the Long Island area . . . The Court concludes that the plaintiffs have failed to establish that the subject spraying was injurious to health."

Effect on wildlife and crops.

"There is no proof that DDT injures plants as

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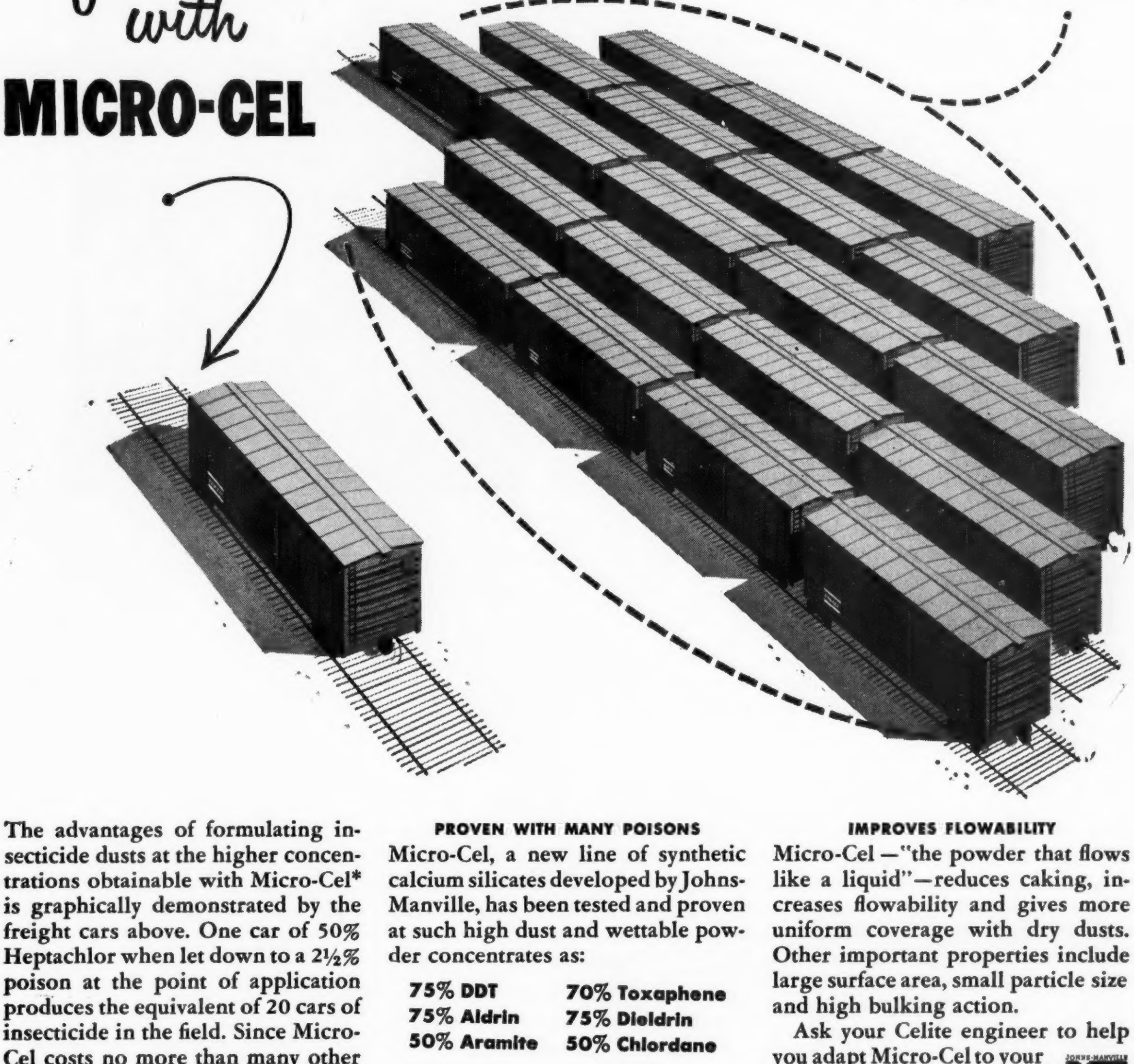
* *Charles Beard, in "American Government and Politics," said, "Indeed, the court (United States Supreme Court) once said that the police power includes full authority 'to prescribe regulations to promote the health, peace, morals, education and good order of the people, and to legislate so as to increase the industries of the state, develop its resources, and add to its wealth and its prosperity.'" Generally speaking, police power means the power that enables the government to foster and protect the health, safety, morals and welfare of its citizens.*

This shipment of 50% Heptachlor concentrate formulated with

MICRO-CEL

—can provide application quantities like this—



The advantages of formulating insecticide dusts at the higher concentrations obtainable with Micro-Cel* is graphically demonstrated by the freight cars above. One car of 50% Heptachlor when let down to a 2½% poison at the point of application produces the equivalent of 20 cars of insecticide in the field. Since Micro-Cel costs no more than many other diluents, the substantial freight savings mean extra profits for you.

PROVEN WITH MANY POISONS

Micro-Cel, a new line of synthetic calcium silicates developed by Johns-Manville, has been tested and proven at such high dust and wettable powder concentrates as:

75% DDT	**70% Toxaphene**
75% Aldrin	**75% Dieldrin**
50% Aramite	**50% Chlordane**

Experiments with other poisons are under way today.

IMPROVES FLOWABILITY

Micro-Cel—"the powder that flows like a liquid"—reduces caking, increases flowability and gives more uniform coverage with dry dusts. Other important properties include large surface area, small particle size and high bulking action.

Ask your Celite engineer to help you adapt Micro-Cel to your particular requirements, or mail coupon below.

JOHNS-MANVILLE JM PRODUCTS

*Micro-Cel® is Johns-Manville's new absorbent-grinding aid designed specifically for the insecticide formulator.

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MICRO-CEL

SYNTHETIC CALCIUM SILICATES

A PRODUCT OF THE CELITE DIVISION

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Please send ☐ further information; ☐ samples of Micro-Cel. I am interested in using Micro-Cel with the following poisons:

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living organisms nor that plants absorb it from the soil and transfer it to edible portions."

"The plaintiffs have not sustained their claim that spraying causes any considerable loss of birds, fish, bees and insects. Only a few fish and birds were killed in the subject area . . ."

Effect on gypsy moth

"There is overwhelming evidence that airplane spraying of DDT has eradicated the gypsy moth in the areas where it has been resorted to, also that it is not possible to accomplish the objective without spraying the entire area . . ."

Methods used

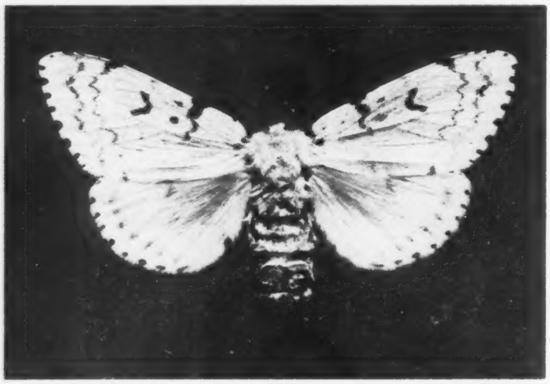
"It would seem that the plaintiffs' major complaint is of annoyance, rather than damage."

"It is evident that more intensive planning, preparation and caution should be exercised in connection with spraying a highly developed and built-up section such as Long Island than is the case of woodlands in the more isolated areas."

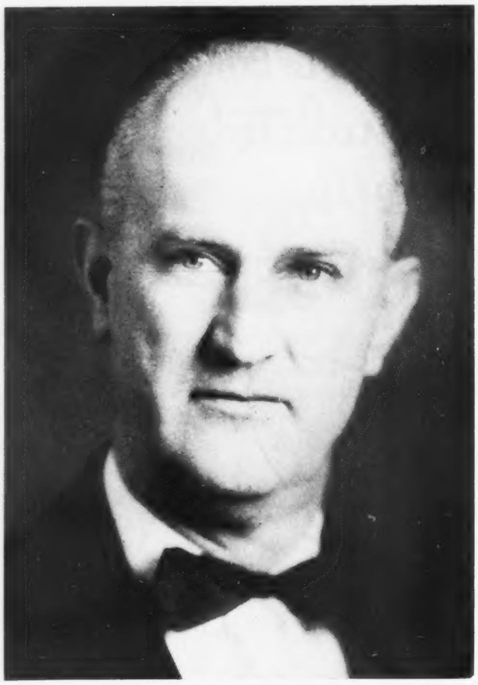
Spraying a valid use of police power?

"The principal issue of law is whether the spraying operation was a valid exercise of the State's police power." The Judge pointed out that Congress and the State of New York passed laws "authorizing the taking of such actions as the respective officials deemed necessary to control or eradicate injurious insects, including the gypsy moth." He then declared: "The legislation clearly is in the public interest . . . mass spraying of insecticide over large areas was the means adopted for carrying out the statutory objectives."

"Accordingly," he states, "I hold that the mass spraying has a reasonable relation to the public objective of combating the evil of the gypsy moth and thus is within the proper exercise of the police power by the designated officials."



Female of the Gypsy Moth (Porthetria Dispar). Because she cannot fly—although males are strong daytime flyers—she lays her eggs near where she emerges from the pupa stage in late summer. Since eradication requires spraying an entire area, the court's refusal to grant an injunction against spraying the property of 14 Long Island residents removes one potential obstacle to the government eradication program.



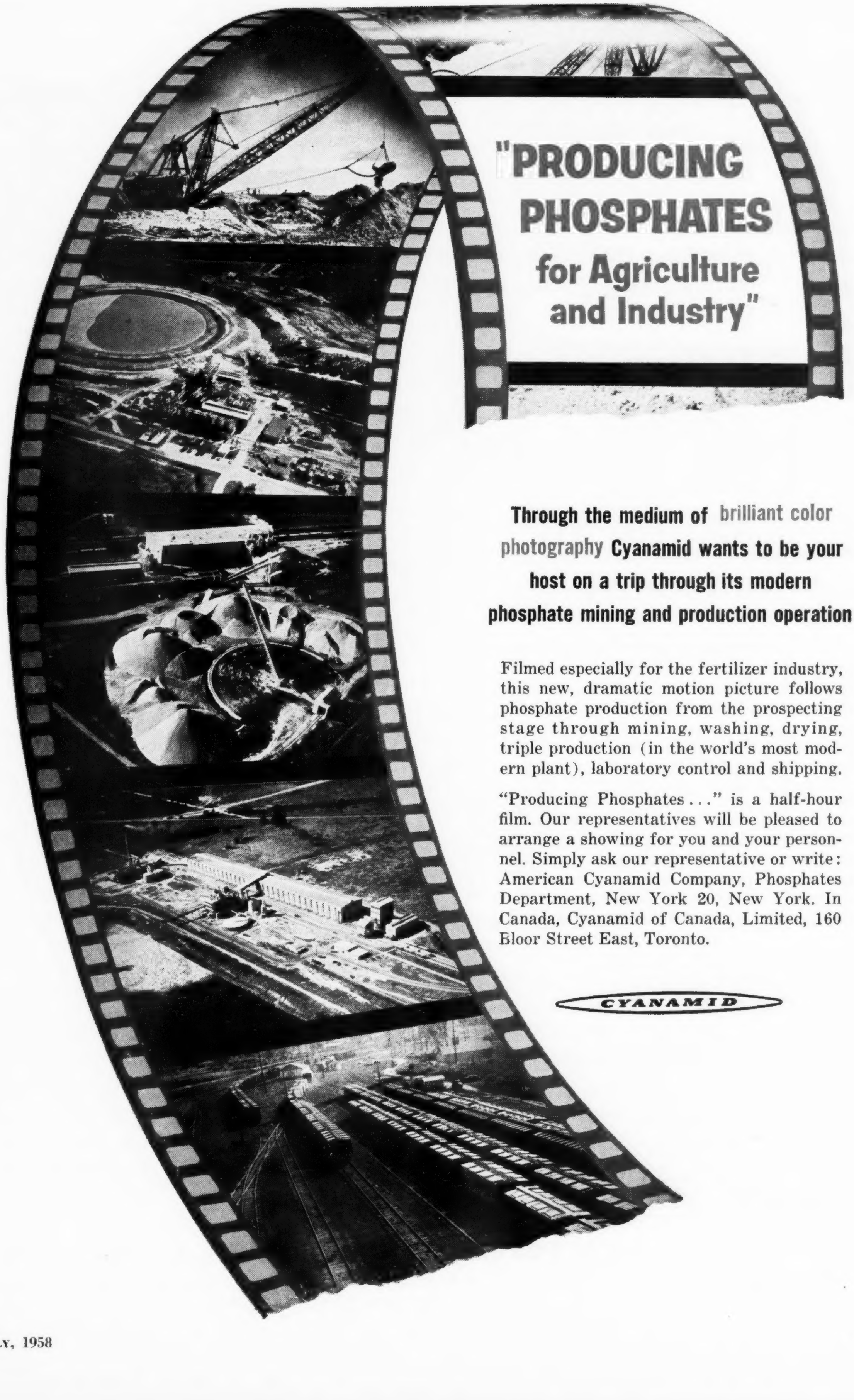
DR. M. R. CLARKSON

Statement by Dr. M. R. Clarkson, Deputy Administrator of the Agricultural Research Service, in charge of Regulatory Services, U.S. Department of Agriculture:

"The successful 1957 spray program against the gypsy moth in Pennsylvania, New Jersey, and New York—like similar programs against this and other insects undertaken elsewhere by the Department—was conducted at the invitation of the states concerned and with their full cooperation.

"The methods used in all such programs in which the Department engages are based on many years of research and wide experience in pest control. The programs have as their sole aim the protection of the economy and resources of the United States and its citizens.

"These cooperative insect-control operations must be established on a sound legal as well as scientific basis, and they must be conducted with conscientious regard for both the public welfare and the rights of individuals. "We welcome the important decision of the Federal District Court in Brooklyn as recognizing the campaign of 1957 against the gypsy moth in New York as meeting these high standards. We are confident that the other insect control and eradication programs in which the Department is now engaged likewise serve national and state interests, aid agriculture, and protect the property of individuals, without encroaching on private rights and privileges."


"PRODUCING
PHOSPHATES
for Agriculture
and Industry"

THE MAN WITH THE ★ MULTIWALL PLAN

UNION
PACKAGING SPECIALIST
WALTER STALER

helps packer cut his Multiwall costs by $60,000

Union Packaging Specialist Walter Staler is an economy expert. His Multiwall customers can vouch for it. One of them—a Midwest packer—recently asked him to analyze his bagging operation. Savings to the company are expected to hit $60,000 a year!

The analysis, made through Union's 5-Star Packaging Efficiency Plan, showed that the basis weight of each bag could be reduced by 20#. Another recommendation: Standardize all Multiwall styles and sizes to improve inventory control and simplify purchasing.

Union Multiwall Recommendations are based on this 5-Star Packaging Efficiency Plan

- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
- PLANT SURVEY

Union also suggested simplifying bag printing by changing it from two-color on both sides to two-color on one side. And, switching from a full white to a less expensive semi-bleached sheet. These improvements, together with new work and copy created by Union's Art Department, resulted in a more attractive, more economical package.

This $60,000 savings story is another example of what can happen when Union's 5-Star Plan goes into action. Why not put it to work in your plant?

Better Multiwall performance through better planning

union camp ®

UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

UNION MULTIWALL BAGS

UNION BAG-CAMP PAPER CORPORATION
233 BROADWAY, NEW YORK 7, N. Y.

Arcadian® News

Volume 3 — For Manufacturers of Mixed Fertilizers — Number 7

HOW TO

hit NITROGEN on the nose!

Methods that Help Insure Accurate Formulation

Do you use plenty of nitrogen in formulating high-nitrogen fertilizers and then find that your analyses do not always meet minimum guarantees?

Are you forced to resort to excessive formulation to get sufficient nitrogen into high-analysis fertilizers?

Have you ever detected the pungent odor of ammonia emerging from the exhaust pipe on the roof of your plant?

When you are faced with any of these problems, it will pay you to take a careful look at the equipment and the methods you use in ammoniation.

In manufacturing pulverized or granulated high-analysis fertilizers, by batch or continuous mixing, failure to hit nitrogen content "on the nose" is often due to poor combination of ammonia with superphosphate and any added acids in the mixer.

Uniform distribution of the acid throughout the mass is just as important as uniform distribution of the ammoniating media. Uniform distribution insures effective utilization of all ingredients.

Efficient maintenance and use of correctly-designed distribution pipes are essential to uniform distribution of the acid and the ammoniating media. Correct techniques of operation must be observed to derive full value from the equipment.

A distribution pipe is basically a metering manifold and accuracy of metering ingredients is vitally important. This accuracy can be destroyed by corrosion and abrasion of the pipe. Corrosion and abrasion are cumulative and may pass unnoticed in their early stages unless a careful checking procedure is diligently maintained.

Improper use of acids and ammoniating media often causes the formation of many large particles too early in the ammoniation stage. This seriously limits further ammonia take-up by the superphosphate. Some of the unreacted acid may be buried inside these particles. Addition of more acid aggravates the situation and is a costly way of handling the problem. In extreme cases, it may also be dangerous.

Important Checkpoints

When your analyses indicate a loss of nitrogen in the ammoniation process, your first checkpoints should be: 1) Is your manpower efficient? 2) Are you using the proper distribution pipes and are these maintained in the best possible operating condition? 3) Are your formulation techniques correct for the fertilizers you wish to produce? 4) Are you using the ammoniating solution that is best suited to your methods and equipment?

Occasionally, loss of nitrogen occurs in the dryer. This may be due to excessive firing of the furnace as a result of poor installation or poor maintenance of the dryer. It may also be caused by forcing equipment beyond its capacity during periods of peak output.

In storage, there is seldom any appreciable loss of nitrogen from conventional formulae. When this does happen, a thorough appraisal of every phase of production should be made immediately.

Ask Nitrogen Division

When you have a formulation or an ammoniation problem, it will pay you to get the advice of Nitrogen Division, Allied Chemical, technical service men. These men have a thorough knowledge of the entire operation of a fertilizer plant. They often assist in the selection of equipment and in the suggestion of more efficient, money-saving methods all along the production line.

This service is available to Nitrogen Division customers without charge. Get the facts from your Nitrogen Division salesman . . . or contact Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y. Phone: Hanover 2-7300

Technical Tips

ACIDS REQUIRE SAFE, EFFICIENT HANDLING

Efficient, economical and safe use of acids in the manufacture of mixed fertilizers depends on proper equipment kept in good working condition and a thorough knowledge of the techniques involved. Improper handling can be expensive and hazardous.

When acid and ammoniating equipment does not function correctly, due to poor handling, faulty design, or deterioration, valuable acids and other ingredients can be wasted without producing fertilizer of the desired analysis and physical condition.

Thorough and uniform distribution of the acid in the mass is vitally important. Although the acid is not volatile and will not escape from the hot mass, it must combine with ammonia to be effective. Volatile ammonia will not "hunt" through the mass to find acid concentrated in spots. Among other things, properly-designed distributor pipes, free of corrosion and abrasion, are essential to uniform distribution of acid.

To achieve a desirable liquid phase in producing granulated fertilizers, heat may be substituted for some moisture. In accomplishing this, the use of considerable quantities of sulfuric acid is advisable to remove more of the controlling influence of water.

In using acids, it is questionable practice for the operator to attempt to solve poor performance of equipment by improvised procedures. For example, many operators have discovered that ammonia fumes will disappear with the addition of more acid.

This is a dangerous procedure, especially if satisfactory results have been previously obtained without the extra acid. Even a small change in the amount of any ingredient may wreck the formula, unless the change has been carefully studied and deemed advisable. Check your equipment and your methods before changing your formula.

Care should be taken to prevent sulfuric acid from contacting a concentrated region of potassium chloride. This promotes efficiency and safety and avoids air pollution problems.

In controlling amounts of acids through metering, weighing or measuring, changes in specific gravity due to temperatures should be taken into consideration. The viscosities of sulfuric and phosphoric acid at low operating temperatures can seriously affect the operation of metering devices. This problem may be solved by the use of magnetic meters or by warming the acid for metering.

It is safer to control the flow of acid by an electrically-driven pump than by air pressure. A pump can be quickly stopped by remote control, whereas air pressure is more difficult to handle.

Because of their limited pressure, centrifugal pumps are usually used for both acids. These are made of stainless steel. Cast iron and black steel are sometimes used for 60° and 66° sulfuric acid. Stainless steel mechanical seals and Blue African asbestos packing and some of the new synthetics are used in pumps.

The action of sulfuric acid on steel and cast iron will release hydrogen which will develop excessive pressure in confined space, such as between closed valves in a line. Hydrogen combined with air can form an inflammable or explosive mixture which necessitates precautions against lights, fires and sparks.

The use of water to flush out steel or stainless steel equipment, including flowmeters, has resulted in severe corrosion and faulty performance. Dilute sulfuric acid is corrosive to some materials that are resistant to the more concentrated 60° and 66° Be sulfuric acids. Even small amounts of moisture in the air may cause localized corrosion if it contacts sulfuric acid.

For safety to employees, all personnel handling acids should wear special goggles, full face masks and heavy rubber gloves. Rubber is quickly attacked by sulfuric acid. Large flow showers should be provided near the dryer areas.

Here is another in the series of educational news features on fertilizer now being released to more than 1,000 newspapers by Nitrogen Division, Allied Chemical.

NEW BUSINESS FROM OLD CUSTOMERS

Do you remember the story about the prospector who spent years searching the far-away hills for gold and then found nuggets in his own back yard?

If you seek new markets for a bigger tonnage of your brand of fertilizer, it may pay you to concentrate your efforts on your own customers in territory near your plant where transportation costs are low and profits are high.

Most farmers are not using nearly as much fertilizer as they could profitably use. For proof of this, check actual tonnage used as compared to official state fertilizer recommendations. You'll discover a big difference, whether you are in Carolina or Kansas, Coachella or Kalamazoo.

Consider the state of Georgia, for example. It's an old state, from a fertilizer standpoint. Georgia farmers have been using fertilizer for a long time and now buy more than 1¼ million tons per year. But there is a big opportunity for more fertilizer sales.

If all the cotton, corn and pasture acreage in Georgia was fertilized according to official recommendations, the farmers of the state would be using 750 thousand *more* tons of mixed fertilizer and 500 thousand *more* tons of nitrogen products for top-dressing. Along with this, they would use five times as much lime as they now use. As a result, cotton, corn and pastures would produce an extra $200 million in farm income for Georgia farmers.

Yes, Georgia cotton needs 40 to 50% more fertilizer for the best yields and profits . . . corn needs 60 to 100% more fertilizer . . . small grains, 50% more . . . soybeans, 100% more . . . and pastures, 200% more. Even high-value crops, such as tobacco, citrus and truck, could profit from 10 to 30% more fertilizer, according to state college recommendations.

Georgia recognizes the need for more plant food, and the state extension service and the fertilizer industry are cooperating in a campaign to urge farmers to get bigger yields and better profits by using more fertilizer. This joint effort is making progress in Georgia. Such a campaign can be equally successful in other states.

In the corn belt, for example, only 40% of the corn crop was fertilized in 1950. By 1954, 64% of the corn in this area got some fertilizer. There are still a lot of acres of corn which get no fertilizer.

And most of the corn that is fertilized needs more fertilizer than it gets. In 1950, the fertilized acre of corn in the corn belt received the equivalent of 200 pounds of 4-12-9, and in 1954 it got the equivalent of 200 pounds of 12-14-14. Many good corn belt farmers use the equivalent of 800 pounds of 20-10-15 and many more need to, year after year.

Your Best Market

Wherever you sell fertilizer, your best market is near your plant. Your own customers can be sold on the idea of using more and better fertilizer.

Per-acre use of fertilizer is gradually inching upward. How can you make it move up faster? It helps to know, and to quote, your state extension service fertilizer recommendations. Most farmers are far below official recommendations in their use of fertilizer.

It pays to cooperate in the soil testing program in your state. When you have accurate knowledge of the plant food needs of a field, you are in a better position to sell the right fertilizer analysis. This produces the best results for the farmer and for you.

Most soils east of the Missouri River need lime to produce top benefits from fertilizer. Starting an off-season lime-spreading service helps build your business as well as the farmer's.

It pays to push high-analysis mixed fertilizer. You save on hauling and handling, and so does the farmer. Since most crops need a high-nitrogen fertilizer program, putting more nitrogen into your mixed fertilizer will benefit both you and the farmer. The farmer gets better crops and you put more of your straight nitrogen sales into your mixed fertilizer bag.

These are only a few ideas that will help you build new business among your present customers in your own sales area. The territory near your plant is a big tonnage opportunity.

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3 Triple

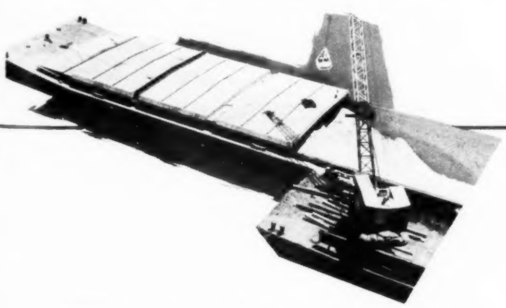
SOLVE EVEN TOUGHEST FORMULATING PROBLEMS

Whether your plant operation demands a fine, coarse or granular texture, International's Triple Superphosphate delivers the form you need.

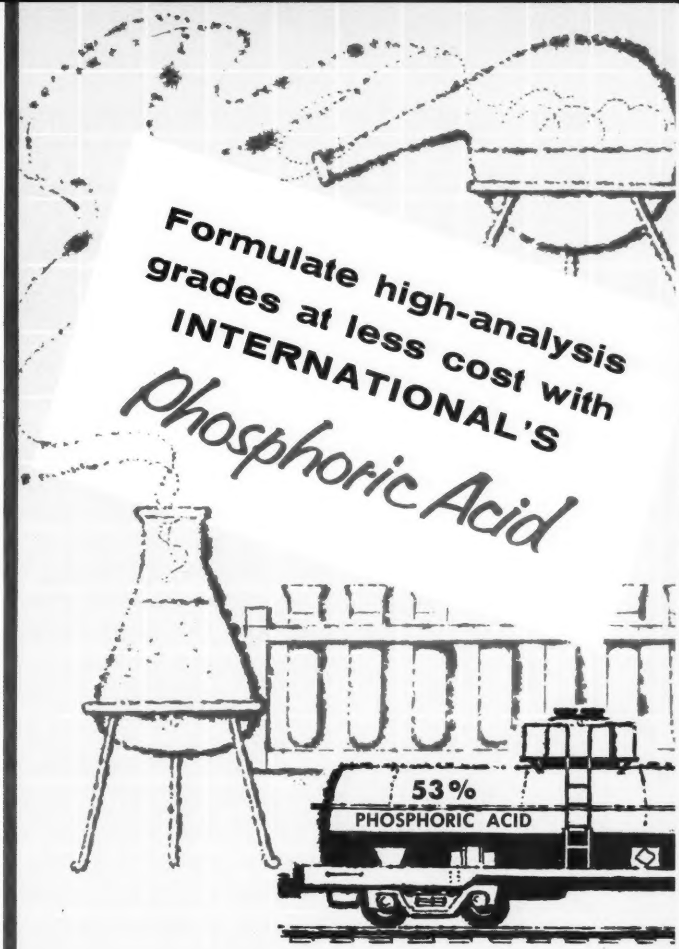
And International offers far more than correct texture. Other bonus values are "built into" each shipment.

- Guaranteed minimum 46% APA — consistent high analysis that reduces unit-delivered cost.
- Extra-long chemical reaction time, unmatched heat control, natural curing promote superior physical and chemical characteristics that make handling and storage easy.
- Uniform high analysis aids in formulation — desirable physical and chemical properties help you hold down reversion problems.

INTERNATIONAL PIONEERS NEW STANDARDS OF SERVICE IN TRIPLE SUPER TRANSPORTATION



When you order International's Triple, you are assured prompt delivery by the nation's most flexible rail, barge or ocean-going vessel system. "On-site" warehousing meets peak load order requirements promptly ... brings hard cash savings to you.



First from International—a high-analysis triple superphosphate ... now, *53%-55% phosphoric acid!* It means one dependable source of supply for all your high-analysis phosphate ingredients.

International's wet-process phosphoric acid is specifically "designed" to help you cut formulation costs.

- Specifications — 53-55% P_2O_5; suspended solids, 1.0% by weight, maximum; specific gravity (60° F), 1.70-1.75.

International's huge Bonnie plant is geared to provide an ever-increasing supply of acid for your use. What's more, International's dependable fleet of rubber-lined tank cars put rush supplies of acid plant-side with the service that makes peak season schedules really hum.

Whether you've already modified your plant to use acid, or have changes in the planning stage, International's research and technical service representatives will help you smooth out production problems ... help you figure ways to cut corners on your formulation costs ... all to help you keep grade analysis consistently high.

READER SERVICE

FREE INFORMATION to help you solve fertilizer, pesticide problems

Chemicals

161—EMULSFIER FOR AGRICULTURAL TOXICANTS

New information has been released by Nopco Chemical on Agrimul TL. A liquid blend of nonionic and anionic surfactants, it is soluble in water and xylene and dispersible in kerosene. Nopco claims that Agrimul TL gives instant emulsions with almost no creaming or oiling out, even under fairly extreme conditions. For details,

CIRCLE 161 ON SERVICE CARD

162—INFORMATION & SAMPLES OF INSTANT ANTIFOAMS

An information sheet and free samples of Hodag instant antifoams are available from Hodag Chemical Corp. The antifoams are available in many different formulations to suit specific requirements. In dry form, they can be admixed with dry insecticides to prevent foaming when used, Hodag reports. The information sheet includes features of the antifoams, when and how to use them, what quantities to use and general theory behind their use. The three-page sheet and samples are easily obtained. Just

CIRCLE 162 ON SERVICE CARD

163—ANHYDROUS AMMONIA BULLETIN FROM SUN OIL

A new technical bulletin on commercial and refrigeration grades of anhydrous ammonia is available from Sun Oil Co. Information is included on physical-chemical properties, specifications and Sun's shipping and service facilities. Copies are available by

CIRCLING 163 ON SERVICE CARD

164—ETHION BROCHURE

A detailed brochure on ethion will be sent to interested research workers by Niagara Chemical Div., Food Machinery & Chemical Corp. Chemically ethion is O,O,O′,O′-tetraethyl S, S′-methylene bis phosphorodithioate. Discovered in Niagara's research laboratories, ethion has demonstrated "good potential as an important insecticide and miticide" in two years of field testing. Research workers may obtain a copy by

CIRCLING 164 ON SERVICE CARD

165—ANTARA SURFACTANTS

A free copy of "Antara Surfactants in Herbicides and Insecticides" is available from Antara Chemicals, Div. of General Aniline & Film Corp. The division supplies wetting agents, emulsifiers, spreaders, solubilizers and dispersing agents to the pesticide industry. For your copy of the booklet describing use of these products in formulations,

CIRCLE 165 ON SERVICE CARD

Process Equipt.

166—HIGH PRESSURE COMPRESSORS

Detailed data on Joy Manufacturing Co.'s heavy-duty high pressure stationary compressors are found in an eight-page bulletin from the company. Specifications on four basic high pressure models, which range in capacity from 368 to 2000 CFM, are included. The compressors are designed for such purposes as soot blowing, chemical processing and gas compression. To obtain the bulletin

CIRCLE 166 ON SERVICE CARD

167—CONTINUOUS GRANULAR FERTILIZER EQUIPMENT

A free bulletin, "Renneburg Continuous Granular Fertilizer Equipment" has been prepared by Edw. Renneburg & Sons Co. The company manufactures ammoniators, coolers, dryers, elevators, granulators and conveyors for the plant food industry. The Renneburg continuous combination ammoniator-granulator is said to save money, save time, save space, offers higher rate of ammoniation and is flexible. For your copy of the bulletin,

CIRCLE 167 ON SERVICE CARD

168—CANNED PUMPS FOR HIGH PRESSURES

A new four page bulletin describes and illustrates a group of typical pumps available from Chempump Corp. for high pressure fluid handling. Capacities to 350 gpm and heads to 250 feet are currently available. A copy is yours, free, if you

CIRCLE 168 ON SERVICE CARD

169—FULL-FLOATING HUM-MER

Fertilizer, stockyard by-products, ores and other materials difficult to screen are getting "improved screening results" through the use of Type 72 Hum-mer electric screens, according to W. S. Tyler Co. The screen is equipped with a spring tensioned "full-floating" screening surface, which is said to give it an extremely effective sorting action. For details,

CIRCLE 169 ON SERVICE CARD

170—GRANULAR FERTILIZER CHAIN MILL

A mill that cracks instead of pulverizes! That's what its granular fertilizer chain mill is, says Fertilizer Engineering & Equipment Co. Normally over 75 per cent of thru-put will be in the selected range of sizing, FEECO claims. Information and an illustrated cutaway view are available.

CIRCLE 170 ON SERVICE CARD

Materials Handling

171—MATERIALS HANDLING FILMS DESCRIBED

A brochure describing the 17 motion picture films available from Clark Equipment Co.'s Industrial Truck Div. has just been published. Films depicting successful materials handling systems in various industries as well as one on safety training for fork truck operators and another on industrial applications of straddle carriers are described. Clark films are available on a loan basis to industrial and commercial firms and educational institutions, at no charge other than return shipping. For a copy of the brochure,

CIRCLE 171 ON SERVICE CARD

172—HAND TRUCK SELECTOR CHART

A new circular designed to simplify the selection of hand lift trucks is available from Lewis-Shepard Products, Inc. Lewis-Shepard says that the illustrated circular enables the buyer to specify the exact hand lift truck for his operation through an easy-to-follow selector chart. Another section of the circular gives tips on where and how hand lift trucks are best utilized in plants and warehouses, as well as on shipping and receiving docks. Free copies are available. Just

CIRCLE 172 ON SERVICE CARD

173—SAVAGE HOPPER SYSTEM

K. E. Savage Company reports that its hopper systems are being used successfully in a number of fertilizer plants. A bulletin from the company describes the system, tells how it operates, gives specifications for elevator, belt conveyors, bin, scale, screen, swivel spout and signal panel, and shows installations of Savage equipment. To get your copy

CIRCLE 173 ON SERVICE CARD

174—ALLIS-CHALMERS FORK LIFT TRUCKS

"Be Years Ahead with Allis-Chalmers Fork Lift Trucks" is a new 16-page, two color catalog now available from Allis-Chalmers Mfg. Co. The catalog covers the company's FT series of lift trucks, describing their design, construction and operation. Illustrations show features of the trucks and the Allis-Chalmers engine powering them. For your copy of the catalog,

CIRCLE 174 ON SERVICE CARD

175—COUNTERWEIGHT VIBRATING FEEDER

Link-Belt Co. reports its new MC motorized counterweight vibrating feeder, a compact low-headroom unit, feeds a wide range of bulk materials at a uniform rate from bins, hoppers or other containers. It evens out surge loads and results in cleaner installations with considerably less maintenance, says Link-Belt. For more information on the feeder,

CIRCLE 175 ON SERVICE CARD

Packaging

176—STOKER FACT FILE

A new fact file folder, containing ten technical data sheets that describe and illustrate all current models of Stoker Packers for filling valve and open mouth bags and drums, has been issued by H. L. Stoker Co. Information also is included on the Stoker Settler, which makes it possible to settle material during the entire filling cycle without transmitting vibration into the weighing mechanism of the packer. The folder will be sent to you if you

CIRCLE 176 ON SERVICE CARD

Miscellaneous

177—ANHYDROUS AMMONIA CONTROL EQUIPMENT

The RegO Div. of Bastian-Blessing Co. has published a new catalog covering its full line of anhydrous ammonia control equipment. Detailed descriptions of multi-purpose valves, globe and angle valves, check valves, relief valves, etc. are clearly presented, along with full ordering information. A new series of hose end valves also is introduced in the 28 page book. To obtain a copy,

CIRCLE 177 ON SERVICE CARD

178—DUST COLLECTION

A wet-type dust collector that separates the dust from the air by centrifugal and impingement action against wetted surfaces is described and illustrated in a revised 12-page bulletin from Dust Suppression & Engineering Co. Dust is separated without the use of sprays, moving elements and water eliminators, reports the company. A copy is yours by

CIRCLING 178 ON SERVICE CARD

179—DRUM RECONDITIONERS

Portland Co. says its drum reconditioning stations automatically strip paint from the outside, clean contents from the inside and rinse and dry both interior and exterior of packages with a single handling—simultaneously and automatically. A bulletin on the machines, describing one-unit to 6-unit models has been issued by the company. Method of operation is described and illustrated in the bulletin. If you'd like a copy,

CIRCLE 179 ON SERVICE CARD

180—ENVIRONMENTAL TEST INSTRUMENTATION

A guide for equipment builders and specifying engineers published by Bristol Co. outlines Bristol indicating, recording, programming and controlling instruments for environmental test equipment. Instruments for measuring, recording and controlling temperature, humidity, altitude, pressure, flow and other variables are offered in a wide range of models. The bulletin also gives specifications for most widely used temperature-measuring systems, absolute pressure gauges, pneumatic, electric and electronic controllers and program controllers. For your copy

CIRCLE 180 ON SERVICE CARD

181—MAKING TITRATIONS WITH BECKMAN pH METERS

Two new application data sheets describe use of Beckman *p*H Meters in titration work. Emphasis is on moisture determinations using Karl Fischer method and more rapid, reproducible titrations—especially with colored or heavy precipitates which make endpoints difficult to observe. Comprehensive bibliography of *p*H and redox titrations in aqueous media is included. For free copies of "*p*H-79-MI" and "Z-80-MI"

CIRCLE 181 ON SERVICE CARD

How to use the

READER SERVICE CARD

- **Circle number of literature you want.**
- **Print or type your name, position, company and address.**
- **Clip and mail the Service Card.**

182—COMPOUNDS THAT FLUORESCE

The American Instrument Co. has recently made available a new data sheet listing over 200 compounds with fluorescent characteristics as shown by the Aminco-Bowman Spectrophotofluorometer. The new list is expected to be highly valuable to the analyst in that it contains many compounds not previously known to fluoresce, the company reports. Data listed includes activation maximum, fluorescence maximum, *p*H and ultimate sensitivity. For the bulletin,

CIRCLE 182 ON SERVICE CARD

183—PLANETARY GEAR OPERATOR

Advantages of the new Rockwell planetary gear operator—for use with Rockwell-Nordstrom Hypreseal wrench operated valves handling high pressures—are described in a four-page, illustrated bulletin issued by Rockwell Manufacturing Co. An operator selection guide and installation directions are also included. Copies are available if you

CIRCLE 183 ON SERVICE CARD

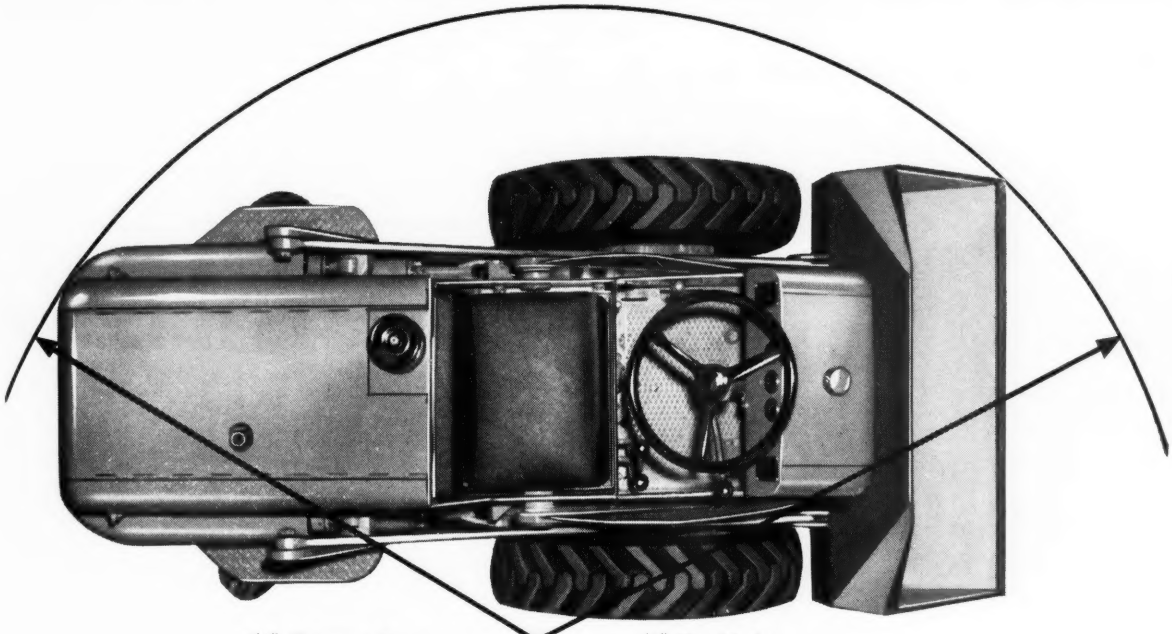
184—SELECTION CHART FOR PLASTIC-PIPE CLAMPS

A new chart for selecting at a glance the proper size of clamp for three classes of plastic pipe in sizes from ½" to 6" has been issued by Wittek Mfg. Co. Copies are available free of charge to all users of plastic pipe.

CIRCLE 184 ON SERVICE CARD

See pages 61, 62 and 63 for information on these Reader Service Numbers:

- 185—Fiberglas Filter
- 186—Plastic Tanks
- 187—Rotary Compressors
- 188—Swivel Stacker
- 189—Dryomatic Dehumidifier
- 190—Metering Pumps
- 191—Photometer
- 192—Emmi Fungicide



6'6" (Outermost Corner, Rear Casting)

6'6" (Tip of Bucket at 3-ft Carry)

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CAPACITY:	15 cu ft
ENGINE:	gasoline, 33.7 hp; diesel, 38 hp
SPEEDS:	2 forward, to 7 mph 2 reverse, to 14 mph
WEIGHT:	gasoline, 6,100 lb; diesel, 6,500 lb

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Name....................
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Company....................
Address....................
City.................... State....................

Report for the year ended June 30, 1957:

FERTILIZER

Table 1. Kinds of fertilizers consumed in regions year ended June 30, 1957[1]

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Territories 2/	Total 3/
MIXTURES: N-P-K	333,640	1,637,694	4,429,274	3,0[illegible]	1,006,010	1,734,143	574,776	29,276	260,812	258,637	13,297,464
N-P	37	188	1,154	45,467	133,250	265	33,082	27,009	84,675	6,271	331,398
P-K	29,614	107,624	187,204	232,527	80,568	174,520	24,616	73	1,681	4,025	848,452
N-K	2	77	194,774	121	291	2,663	0	32	970	26,563	225,493
CHEMICAL NITROGEN MATERIALS											
Ammonia, anhydrous	0	2,100	21,820	34,542	96,924	57,450	105,836	32,786	100,340	904	452,702
Ammonia, aqua: 19-25% N	0	0	0	2,288	2,854	258	1,614	16,904	285,503	72,011	381,432
Ammonium nitrate 4/	7,396	27,855	122,258	124,567	213,989	328,071	139,798	44,689	96,573	0	1,105,196
Ammonium nitrate-limestone mixtures	61	1,607	256,110	805	126	40,002	463	1,117	295	0	300,586
Ammonium sulfate	333	3,789	5,680	92,115	6,835	5,629	75,704	56,210	207,783	62,105	516,183
Calcium cyanamide	1,341	8,799	9,762	1,383	41	9,396	6,816	1,051	8,389	0	46,978
Calcium nitrate	6	3	6,287	0	0	0	2	9,110	35,083	42	50,533
Nitrogen solutions: 19-45% N	224	2,955	75,941	38,147	50,374	8,854	17,688	5,879	45,816	0	245,878
Sodium nitrate	1,492	10,627	280,531	1,288	67	150,495	47,637	576	320	126	493,159
Urea	1,228	2,757	5,425	11,773	7,375	1,172	13,477	21,709	27,084	14,916	108,916
Other	60	719	2,123	264	287	28	408	970	6	0	4,865
NATURAL ORGANIC MATERIALS											
Blood, dried	3	13	19	0	1	0	1	12	3,354	0	3,403
Castor pomace	1,897	110	2,601	0	0	0	1,145	0	844	0	6,597
Compost 5/	0	83	2	3,231	96	92	1,721	0	745	0	5,970
Cottonseed meal 5/	7,641	81	2,021	4	0	150	407	0	0	0	10,304
Fish scrap, meal, emulsions	343	4	0	0	0	0	0	2	1,375	0	1,724
Manures, dried	4,279	12,233	2,686	8,037	9,354	1,094	2,773	9,674	250,911	1	294,242
Sewage sludge, activated	5,554	12,575	7,702	28,254	7,356	1,270	2,138	5,139	23,114	50	93,152
Sewage sludge, other	0	75	0	593	97	0	0	0	36,812	0	37,577
Tankage, animal	3	91	0	433	0	0	0	0	0	0	527
Tankage, process	3,660	8,494	3,531	363	213	4	0	0	1,639	0	17,904
Other	846	120	2,622	33	0	0	8	73	4,569	0	8,271
PHOSPHATE MATERIALS											
Ammonium phosphate: 11-48 6/	0	481	0	7,919	28,657	184	2,067	7,554	14,710	2,113	63,885
" " 13-39 6/	0	0	0	687	16,603	6	18,061	4,312	5,987	0	45,656
Ammonium phosphate sulfate: 16-20 6/	0	6	0	753	96,575	76	60,653	40,536	100,848	238	259,685
Ammonium phosphate nitrate: 27-14 6/	0	0	0	0	812	0	0	3,963	6,289	0	11,064
Ammoniated superphosphate 7/	0	115	121	0	0	0	0	0	6,108	531	6,875
Basic slag	0	0	22,955	0	0	136,734	2,973	0	0	0	162,662
Bonemeal: raw and steamed	1,372	3,417	1,536	1,866	148	477	630	1	2,559	0	12,006
Calcium metaphosphate	0	619	3,119	10,282	15,279	14,685	1,168	133	34	0	45,319
Diammonium phosphate: 21-53 6/	0	89	1,093	2,097	6,360	1,888	3,141	4,707	205	0	19,780
Phosphoric acid: 51-55% P_2O_5	0	0	0	0	0	0	1,603	7,818	8,637	0	18,058
Phosphate rock	115	6,468	27,991	547,697	209,888	21,831	9,984	0	1,119	4,357	819,570
Colloidal phosphate	0	40	679	1,631	1,810	8,284	1,725	0	444	0	16,613
Superphosphate: 18%	7,016	11,083	22,833	22,628	21,461	19,487	0	852	0	20	105,380
" 19%	142	40	2,756	87	1,004	1,339	0	6,925	76,506	0	90,799
" 20-22%	21,046	62,958	29,301	45,422	16,489	80,433	77,311	12,005	0	6,854	363,819
" 23-41%	0	3,247	0	1,991	409	0	231	338	0	0	6,216
" 42-44%	0	0	0	0	30,220	0	0	37,538	0	2	67,760
" 45%	6	4,719	12	51,986	79,015	2,106	32,567	33,043	23,659	250	227,363
" 46%	41	56	234	7,437	26,766	4,504	11,965	5,799	0	4,418	61,320
" 47-48%	10	33	365	9,587	2,730	1,676	2,915	0	0	0	10,316
" 49-52%	0	43	0	703	129	114	5	0	0	0	994
Other	177	1	179	0	118	106	42	0	0	0	823
POTASH MATERIALS											
Cotton hull ashes	378	100	0	67	0	0	0	0	0	0	545
Lime-potash mixtures 8/	0	185	21,688	0	0	10,200	0	0	0	0	32,073
Manure salts: 21-26% K_2O	0	3	539	43	0	0	465	316	0	0	1,372
Potassium chloride: 48-52% K_2O	4	13	0	2,405	513	2,296	382	25	0	0	5,638
" 58-62% K_2O	1,852	4,138	40,961	172,362	41,587	50,997	37,017	944	5,905	15,168	370,531
" magnesium sulfate	155	981	1,860	2,701	408	1,137	30	59	340	8	7,679
" sodium nitrate 7/	0	0	9,278	4	0	0	0	51	0	40	9,373
" sulfate	141	1,437	5,915	1,918	519	6,698	156	1,100	6,106	2,340	26,324
Other	160	6	7,009	2	90	0	79	17	0	0	7,364
TOTAL: PRIMARY NUTRIENT FERTILIZERS	434,495	1,940,957	5,820,151	4,552,713	2,180,698	2,870,808	1,315,280	430,327	1,738,149	482,190	21,765,768
SECONDARY & TRACE NUTRIENT MATERIALS											
Aluminum sulfate 5/	2	6	2	0	0	0	0	0	90	0	100
Borax 5/	77	285	767	209	85	301	34	1	543	0	2,302
Calcium sulfate (gypsum)	272	3,940	104,265	220	3,449	1,930	167	19,383	757,665	26	891,317
Copper sulfate 5/	0	50	303	30	3	0	0	0	154	0	540
Iron sulfate 5/	0	0	32	0	3	0	0	596	4,433	2,494	7,558
Magnesium sulfate 5/	19	214	1,807	115	89	0	0	0	655	0	2,899
Manganese sulfate 5/	5	116	218	1,238	5	0	0	30	122	0	1,734
Mixed minerals 5/	0	191	12	72	175	94	40	178	4,316	0	5,078
Sulfur: 25-99% S	15	70	104	29	23	1	1,562	1,891	16,491	2	20,188
Sulfuric acid: 40-93%	0	0	0	0	0	0	1,235	1,390	1,921	0	4,546
Zinc sulfate 5/	0	34	125	2	5	74	0	306	1,966	82	2,594
Other	0	1	0	109	0	0	0	0	4,277	0	4,387
SECONDARY & TRACE NUTRIENT MATERIALS	390	4,907	107,635	2,024	3,837	2,400	3,038	23,775	792,6[illegible]	2,604	943,243
GRAND TOTAL	434,885	1,945,864	5,927,786	4,554,737	2,184,535	2,873,208	1,318,318	454,102	2,530,782	484,794	22,709,011

1/ Includes 6,003 tons of ammonium nitrate, 2,888 tons of diammonium phosphate, 5,861 tons of calcium metaphosphate, and 540 tons of superphosphate (47%) distributed by Government agencies for test demonstration. Does not include the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures. 2/ Hawaii and Puerto Rico. 3/ The primary plant nutrient content of mixtures is shown in Table II, and of the principal materials in Table 12. 4/ Minor quantities may have been used for other purposes than fertilizer. 5/ Distributed by manufacturers of fertilizers. 6/ Includes quantities reported as mixtures. 7/ Additional quantities may have been reported as mixtures. 8/ Additional quantities are given free to farmers for which no records are kept.

THE consumption of fertilizers and their primary plant nutrient (N, P_2O_5, K_2O) content are shown for the United States, by individual States, the District of Columbia, Hawaii, and the Commonwealth of Puerto Rico, for the year ended June 30, 1957 in this 18th report. Data on consumption of fertilizers in other possessions are difficult to obtain accurately and are insignificant when compared to the total for the United States. For example about 600 tons of fertilizers are being used annually in Alaska but are not included in this report.

The data presented in tables 1 through 13 were compiled from information furnished by manufacturers showing the tonnage of each grade shipped to agents, dealers, and consumers in all the areas tabulated except California, Florida, Massachusetts, Missouri, North Carolina, South Carolina, Texas, and Virginia. The data for these States were compiled chiefly from the reports of the fertilizer control officials of the respective States. Supplementary information was supplied by State agencies, as well as by fertilizer brokers. Special inquiries were made of all known distributors and custom applicators of anhydrous ammonia and nitrogen solutions.

The quantities of N, P_2O_5, and K_2O shown in this report are based on the average analyses of samples of the products by fertilizer control officials for the State in which they were consumed, rather than on the manufacturers' guarantees. Thus, the overruns or underruns of nutrients from the guarantees are taken into account. This gives more nearly the actual tonnages of nutrients consumed than the guarantees would.

The comparisons of the changes in

and PLANT NUTRIENT CONSUMPTION in the U.S.

BY
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Soil and Water Conservation
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Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

Table 2. Regional change in consumption of fertilizers in year ended June 30, 1957, from that in the preceding year

Region	Change from previous year in consumption as					
	Mixtures Tons	Materials[1] Tons	Total[1] Tons	Mixtures Per cent	Materials[1] Per cent	Total[1] Per cent
New England	15,723	2,830	18,553	4.5	4.1	4.5
Middle Atlantic	5,699	−4,006	1,693	.3	−2.0	.1
South Atlantic	−27,089	−9,653	−36,742	−.6	−1.0	−.6
East North Central	−62,532	102,646	40,114	−1.8	9.1	.9
West North Central	38,322	80,429	118,751	3.2	9.1	5.8
East South Central	−69,110	41,228	−27,882	−3.5	4.5	−1.0
West South Central	−70,615	19,639	−50,976	−10.0	3.0	−3.7
Mountain	8,514	61,314	69,828	17.8	20.0	19.4
Pacific	39,240	102,596	141,836	12.7	8.0	8.9
Continental U. S.	−121,848	397,023	275,175	−.8	6.1	1.3
Territories	49,002	37,226	86,228	19.9	24.9	21.8
Total	−72,846	434,249	361,403	−.5	6.6	1.7

[1] Excluding the quantity of secondary and trace nutrient materials.

fertilizer consumption are based on the tonnages of fertilizers containing primary nutrients, in order that a direct comparison may be made with the change in the quantities of N, P_2O_5, and K_2O consumed.

Quantities are reported as 2,000-pound tons. Although the data refer to shipments, the terms "consumption", "sales", and "shipments" are used synonymously. Actual consumption differs slightly, no doubt, from either shipments or sales.

ALL FERTILIZERS

The total quantity of the various kinds of fertilizers consumed in the year ended June 30, 1957, amounted to 22,709,011 tons (table 1). This quantity included the secondary and trace nutrient materials and increased 515,041 tons from the 22,193,970 tons, revised, used in the preceding year. The 1956–57 consumption of fertilizers comprised 21,765,768 tons of products containing one or more of the primary nutrients, and 943,243 tons of the secondary and trace nutrient materials which did not contain N, P_2O_5, or K_2O. The quantity of fertilizer containing primary nutrients was 361,403 tons (1.7 percent) above that (21,404,365 tons revised) in 1955–56. Consumption of the secondary and trace nutrient materials was 153,638 tons (19.5 percent) above the quantity (789,605 tons) used in the preceding year.

The changes in consumption of the classes of fertilizers containing primary nutrients from 1955–56 is summarized by regions in table 2.

Unlike the year 1955–56 when consumption of fertilizers in most of the regions was lower than in 1954–55, consumption in 1956–57 was higher than in 1955–56 in all but a few regions. In the few exceptions where consumption was lower, the amount of decrease was usually not as great as occurred the previous year. Consumption of mixtures in the South Central region has continued to decrease which was offset, in part, by a higher use of materials. Only in the Pacific region has consumption of both classes increased and in the South Atlantic region, decreased in the two years, respectively.

Consumption of fertilizers containing primary nutrients increased in 36 of the tabulated areas and decreased in 15 (table 3). In comparison with consumption in 1955–56, increases ranged up to 37 percent for Montana while decreases ranged downward to 20 percent for Oklahoma. In tabulated areas showing increased consumption, the average was 6.0 percent while in those areas showing decreases, the average was 4.5 per cent resulting in a weighted average increase of 1.7 percent for the United States. The tonnage of fertilizers consumed was noticeably, although not significantly, higher in most of the northern and western States, while the southeastern States generally consumed lower amounts.

Compared with consumption in each six-month period of 1955–56, the tonnage of mixtures and materials in the July-December period was higher by 158,467 and 241,170 tons, respectively. Consumption in the January-June period was 231,313 tons (2.1 percent) lower in

Table 3. Fertilizers consumed as mixtures and as separate materials

State and region	Mixtures			Materials 1/			Grand total	Comparison with year ended June 30, 1956	
	July 1 - Dec. 31, 1956	Jan. 1 - June 30, 1957	Total	July 1 - Dec. 31, 1956	Jan. 1 - June 30, 1957	Total		Fertilizer consumption 2/	Total N, avail. P_2O_5 & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	13,520	149,789	163,309	2,518	6,288	8,806	172,115	94	95
New Hampshire	2,329	12,798	15,127	953	3,309	4,262	19,389	119	125
Vermont	4,277	33,744	38,021	13,669	3,722	17,391	55,412	109	112
Massachusetts	13,579	55,312	68,891	5,849	11,990	17,839	86,730	117	123
Rhode Island	1,840	13,119	14,959	426	1,501	1,927	16,886	113	116
Connecticut	10,145	52,841	62,986	4,163	17,204	21,367	84,353	110	113
New England	45,690	317,603	363,293	27,578	44,014	71,592	434,885	104	106
New York	104,227	394,806	499,033	23,814	55,229	79,043	578,076	101	105
New Jersey	52,945	192,612	245,557	6,728	16,221	22,949	268,506	102	101
Pennsylvania	158,500	410,007	568,507	19,881	45,934	65,815	634,322	97	100
Delaware	13,294	69,594	82,888	942	3,743	4,685	87,573	102	103
District of Columbia	364	1,406	1,770	291	521	812	2,582	101	94
Maryland	65,364	210,303	275,667	4,779	11,985	16,764	292,431	104	105
West Virginia	13,909	58,252	72,161	2,878	7,335	10,213	82,374	97	99
Middle Atlantic	408,603	1,336,980	1,745,583	59,313	140,968	200,281	1,945,864	100	103
Virginia	142,596	524,735	667,331	11,532	93,000	104,532	771,863	99	101
North Carolina	195,847	1,019,862	1,215,709	52,714	298,874	351,588	1,567,297	92	98
South Carolina	89,581	476,411	565,992	33,359	218,715	252,074	818,066	95	96
Georgia	206,299	841,434	1,047,733	37,564	208,145	245,709	1,293,442	101	106
Florida	549,230	766,411	1,315,641	65,722	95,755	161,477	1,477,118	110	112
South Atlantic	1,183,553	3,628,853	4,812,406	200,891	914,489	1,115,380	5,927,786	99	103
Ohio	271,289	681,739	953,028	18,509	64,160	82,669	1,035,697	99	103
Indiana	265,504	617,687	883,191	38,501	165,214	203,715	1,086,906	102	104
Illinois	162,468	351,368	513,836	446,104	409,022	855,126	1,368,962	101	108
Michigan	172,080	405,730	577,810	15,632	43,253	58,885	636,695	101	104
Wisconsin	65,047	324,405	389,452	9,497	27,528	37,025	426,477	103	106
East North Central	936,388	2,380,929	3,317,317	528,243	709,177	1,237,420	4,554,737	101	105
Minnesota	69,189	256,902	326,091	24,548	75,508	100,056	426,147	116	116
Iowa	47,562	259,899	307,461	39,467	121,284	160,751	468,212	104	105
Missouri	179,584	262,904	442,488	156,165	203,623	359,788	802,276	99	107
North Dakota	6,673	23,336	30,009	12,551	39,185	51,736	81,745	118	117
South Dakota	1,640	8,090	9,730	2,391	12,454	14,845	24,575	92	92
Nebraska	3,703	21,016	24,719	23,071	121,942	145,013	169,732	128	130
Kansas	47,170	32,451	79,621	65,703	66,524	132,227	211,848	102	105
West North Central	355,521	864,598	1,220,119	323,896	640,520	964,416	2,184,535	106	110
Kentucky	68,803	368,191	436,994	21,526	83,706	105,232	542,226	101	104
Tennessee	99,649	323,953	423,602	34,276	87,235	121,511	545,113	106	106
Alabama	132,292	617,251	749,543	64,197	225,624	289,821	1,039,364	94	99
Mississippi	21,284	280,168	301,452	198,732	246,321	445,053	746,505	100	103
East South Central	322,028	1,589,563	1,911,591	318,731	642,886	961,617	2,873,208	99	103
Arkansas	23,358	117,346	140,704	36,186	149,348	185,534	326,238	90	92
Louisiana	37,361	117,080	154,441	35,959	98,166	134,125	288,566	95	100
Oklahoma	29,424	32,577	62,001	25,359	20,763	46,122	108,123	80	85
Texas	89,770	185,558	275,328	112,668	207,395	320,063	595,391	105	115
West South Central	179,913	452,561	632,474	210,172	475,672	685,844	1,318,318	96	102
Montana	789	3,118	3,907	10,597	29,416	40,013	43,920	137	141
Idaho	453	7,529	7,982	24,208	53,203	77,411	85,393	130	126
Wyoming	263	1,005	1,268	674	8,501	9,175	10,443	93	96
Colorado	1,736	8,989	10,725	10,781	37,671	48,452	59,177	110	116
New Mexico	201	1,379	1,580	6,419	29,645	36,064	37,644	130	127
Arizona	7,346	17,290	24,636	57,483	95,984	153,467	178,103	117	116
Utah	572	4,352	4,924	2,657	24,736	27,393	32,317	105	100
Nevada	547	821	1,368	2,416	3,321	5,737	7,105	136	137
Mountain	11,907	44,483	56,390	115,235	282,477	397,712	454,102	119	119
Washington	6,255	30,626	36,881	56,428	91,266	147,694	184,575	108	106
Oregon	6,835	22,676	29,511	59,230	129,328	188,558	218,069	131	126
California	103,650	178,096	281,746	887,290	959,102	1,846,392	2,128,138	106	107
Pacific	116,740	231,398	348,138	1,002,948	1,179,696	2,182,644	2,530,782	109	109
Continental U. S.	3,560,343	10,846,968	14,407,311	2,787,007	5,029,899	7,816,906	22,224,217	101	105
Hawaii	34,703	30,725	65,428	63,398	65,610	129,008	194,436	118	117
Puerto Rico	109,334	120,734	230,068	25,321	34,969	60,290	290,358	125	121
Territories	144,037	151,459	295,496	88,719	100,579	189,298	484,794	122	119
Total: 1956-57	3,704,380	10,998,427	14,702,807	2,875,726	5,130,478	8,006,204	22,709,011	102	105
1955-56	3,545,913	11,229,740	14,775,653	2,508,638	3/ 4,909,679	3/ 7,418,317	3/ 22,193,970	100	100
1954-55	3,621,898	11,725,952	15,347,850	2,504,621	4,873,991	7,378,612	22,726,462	102	101

1/ Including ground phosphate, basic slag, secondary and trace nutrient materials, such as, borax, sulfur, magnesium sulfate, gypsum, etc., used as separate materials; also 15,292 tons of fertilizers distributed by Government agencies for test demonstrations. Does not include liming materials or quantities of materials used for manufacture of commercial mixtures. 2/ Fertilizers which were guaranteed to contain one or more of the primary plant nutrients, (N, P_2O_5, K_2O). 3/ Revised by addition of 900 tons of anhydrous ammonia to Wyoming total.

mixtures and 193,079 tons (4.3 percent) higher in materials exclusive of secondary and trace nutrient materials listed in table 1. Total changes for the year were a decrease of 72,846 tons in mixtures and an increase of 434,249 tons in materials. The proportionate increase of materials in the January-June period was but 4.3 percent as compared with 11.2 percent in the July-December period.

MIXTURES

In 1956–57 the total consumption of commercial mixtures amounted to 14,702,807 tons (table 3). There were 1,690 grades reported. In addition, over 500 mixtures, not reported by grades, were used in California and an unknown number reported as miscellaneous tonnages by manufacturers in other States. Mixtures consumed in 1956–57 represented 64.7 percent of the quantity of all fertilizers compared with 66.6 percent for the preceding year.

The total consumption of mixtures in 1956–57 was 72,846 tons (0.5 percent) lower than in 1955–56, compared to a large decrease (572,197 tons) in 1955–56 from 1954–55. In 1956–57, a cumulative increase of 395,607 tons of mixtures was reported for 30 tabulated areas and a decrease of 468,453 tons for 21 areas. Areas in which the consumption of mixtures was generally lower than in 1955–56 were those located in the East North Central and southeastern regions of the United States.

The N–P–K mixtures shown in table 1 represented 90.4 percent of the total tonnage of mixtures consumed, while consumption of the other classes (N–P, P–K, N–K) was 2.3 percent, 5.8 percent, and 1.5 percent, respectively. The N–P–K class was used in amounts representing more than 80 percent of the tonnage of mixtures in all regions except the Mountain and Pacific. In the Mountain region the tonnages of N–P–K and N–P mixtures were used in amounts representing 51.9 and 47.9 percent of the regional total, respectively, while in the Pacific region, these classes represented 74.9 and 24.3 percent, respectively.

In the continental United States, there were 175 grades consumed in individual amounts of 4,000 tons or more (table 4). These totaled 13,745,381 tons and accounted for 95.40 percent of the quantity of mixtures used on the Continent. Other grades consumed numbered 1,335 and amounted to 317,969 tons (2.21 percent). The balance (343,961 tons, 2.39 percent) represented mixtures not reported by grades.

Consumption of mixtures in Hawaii and Puerto Rico amounted to 295,496 tons in 180 grades. While many of the grades in Puerto Rico are similar to those used on the Continent, most of those in Hawaii are designated in fractional numbers.

The 15 grades consumed in largest tonnages in 1956–57 in each of the Continental regions and Puerto Rico are shown in table 5, together with the quantities for each State in the region. At least 11 of the grades in each area were among the 15 consumed in largest tonnages the preceding year, but not always in the same relative order of tonnage. These grades, in 1956–57, accounted for 50 percent or more of the total consumption of mixtures in Puerto Rico and each of the States except California, Colorado, Florida, New Mexico, North Dakota, Washington, and Wyoming. The total tonnages of the 15 grades shown represented 62.1 percent of the total tonnage of mixtures consumed on the Continent. Approximately one percent of the number of grades used on the Continent represented nearly two-thirds of the total tonnage of mixtures consumed.

In 1955–56 and 1956–57 the 5-10-10 grade was consumed in largest tonnage. Grade 4-12-12 was next in 1956–57 having replaced the 3-12-12 grade which for six years through 1954–55 had been the first grade in tonnage. Though the 5-10-10 grade was consumed in largest tonnage in 1956–57, it represents the class having the ratio of 1:2:2. Grades with a ratio of 1:4:4 (table 6) were most often used in the continental United States in 1956–57 but the second ranking ratio represents the most widely used 5-10-10 grade. The cumulative tonnages of all grades reported in ratios of the 10 listed accounted for 73.5 percent of the total tonnages of mixtures consumed on the Continent in 1956–57.

The national weighted average of the primary nutrients contained in mixtures in 1956–57 was 5.74 percent N, 12.36 percent available P_2O_5, and 11.44 percent K_2O, a total of 29.54 percent (table 7). The corresponding values in the preceding year were 5.39, 12.08, 11.20, and 28.67 percent. The proportionate increase was highest for N (6.49 percent), while that for available P_2O_5 was but 2.32 percent, and for K_2O only 2.14 percent.

Compared with 1955–56 the average primary nutrient content of all mixtures consumed in each of the 51 tabulated areas in 1956–57 showed N increases in 40 and decreases in 11, available P_2O_5 increases or no change in 38 and decreases in 13, K_2O increases or no change in 39 and decreases in 12. As in the preceding year, the West South Central region was the only area in which the

Table 4. Principal grades of mixtures consumed in continental U. S., year ended June 30, 1957, compared with consumption of previous year

Grade	Consumption 1/ 1956	Consumption 1/ 1957	Proportion of total 1956	Proportion of total 1957
	Tons	Tons	Percent	Percent
0-8-24	5,540	8,097	0.03	0.05
0-9-27	11,816	13,848	.08	.10
0-10-10	3,547	5,350	.03	.03
0-10-20	62,640	77,023	.43	.54
0-10-30	41,660	47,908	.29	.33
0-12-12	20,064	13,573	.13	.10
0-12-20	16,373	4,362	.12	.03
0-12-36	10,707	10,546	.07	.07
0-14-14	174,442	162,169	1.21	1.12
0-15-30	15,256	20,002	.10	.14
0-15-45	4,879	5,633	.03	.04
0-16-8	46,697	45,824	.33	.32
0-20-10	11,335	10,448	.07	.07
0-20-20	310,275	304,514	2.14	2.12
0-24-24	8,912	9,331	.06	.06
0-25-25	17,837	27,032	.12	.19
0-30-15	11,587	13,561	.08	.09
0-30-30	20,984	15,879	.15	.11
2-12-6	27,156	16,216	.18	.12
2-12-12	400,811	371,393	2.76	2.57
3-8-8	9,173	5,969	.06	.05
3-9-6	367,517	251,084	2.53	1.74
3-9-9	478,163	528,959	3.29	3.67
3-9-12	33,474	26,998	.24	.19
3-9-15	8,400	7,739	.05	.05
3-9-18	70,990	61,932	.49	.43
3-9-27	95,000	75,262	.66	.52
3-11-11	2,645	9,785	.02	.07
3-12-6	152,357	108,552	1.04	.75
3-12-12	1,171,479	908,575	8.07	6.31
3-18-9	41,699	36,428	.28	.25
4-4-2	5,050	8,274	.04	.06
4-6-6	8,503	10,635	.06	.07
4-6-8	38,981	43,788	.27	.31
4-7-5	115,248	118,792	.79	.82
4-8-4	11,311	12,340	.08	.09
4-8-6	190,357	143,180	1.31	.99
4-8-8	219,923	208,791	1.51	1.45
4-8-10	115,008	87,176	.79	.60
4-8-12	53,139	74,057	.37	.52
4-8-16	2,566	4,894	.02	.03
4-9-3	63,442	52,208	.43	.36
4-10-6	368,797	105,956	2.54	.74
4-10-7	469,543	362,433	3.23	2.52
4-10-8	3,071	4,133	.03	.02
4-10-10	10,657	17,075	.07	.12
4-12-4	84,300	61,625	.58	.43
4-12-8	146,648	148,832	1.01	1.03
4-12-12	737,215	949,433	5.07	6.59
4-16-8	23,225	22,371	.16	.16
4-16-16	615,595	527,812	4.24	3.66
4-24-12	24,865	19,557	.17	.14
5-3-2	610	4,697	(2/)	.03
5-3-6	3,559	4,502	.03	.03
5-5-6	2,086	4,946	.01	.03
5-5-8	7,085	7,063	.05	.05
5-6-8	9,399	10,264	.07	.07
5-7-5	22,008	22,311	.15	.15
5-8-7	10,294	9,743	.07	.07
5-8-8	5,307	7,007	.03	.05
5-10-5	678,083	604,630	4.67	4.19
5-10-10	1,296,912	1,407,706	8.93	9.78
5-10-15	128,086	150,218	.88	1.04
5-10-20	8,589	8,445	.06	.06
5-10-30	3,317	4,109	.02	.02
5-12-10	0	5,731	0	.04
5-15-8	127	5,774	(2/)	.04
5-15-30	6,298	5,988	.04	.05
5-20-10	58,433	73,446	.41	.51
5-20-20	699,511	787,324	4.81	5.46
5-40-0	5,966	7,725	.04	.05
6-3-6	14,094	11,508	.10	.08
6-4-6	19,139	20,022	.13	.14
6-4-8	43,944	59,255	.30	.41
6-6-6	85,327	95,018	.59	.66
6-6-8	31,430	37,781	.21	.27
6-6-12	9,934	12,033	.07	.08
6-6-18	11,070	9,832	.08	.07
6-7-7	4,126	4,121	.03	.03
6-8-4	104,043	8,339	.72	.05
6-8-6	123,735	130,846	.85	.91
6-8-8	268,288	278,438	1.85	1.94
6-8-12	24,559	16,979	.17	.11
6-9-3	5,280	4,398	.03	.03
6-9-6	8,802	7,580	.06	.06
6-9-12	36,971	24,767	.25	.17
6-10-4	77,937	89,016	.54	.62
6-10-8	5,819	7,193	.04	.05
6-12-4	3,944	4,439	.02	.03
6-12-6	41,708	34,330	.29	.24

Grade	Consumption 1/ 1956	Consumption 1/ 1957	Proportion of total 1956	Proportion of total 1957
	Tons	Tons	Percent	Percent
6-12-12	334,595	371,569	2.30	2.57
6-12-15	3,360	13,966	.03	.10
6-12-18	6,610	8,897	.04	.06
6-18-6	3,215	14,414	.02	.10
6-18-18	8,834	10,409	.07	.08
6-20-20	4,499	4,950	.03	.03
6-24-0	7,909	6,126	.05	.04
6-24-12	84,454	105,127	.58	.73
6-24-24	44,673	63,358	.31	.44
6-40-0	0	7,120	0	.05
7-5-7	0	6,561	0	.05
7-7-7	24,767	24,417	.17	.17
7-8-8	7,705	8,672	.05	.06
7-9-9	3,737	5,041	.03	.04
7-14-7	3,902	5,168	.03	.03
7-28-14	531	14,204	(2/)	.10
8-0-8	12,278	11,022	.08	.08
8-0-12	5,820	4,001	.04	.02
8-0-24	21,111	17,869	.15	.13
8-3-8	12,252	13,818	.08	.09
8-4-6	6,150	7,641	.04	.06
8-4-8	37,168	41,763	.26	.29
8-4-12	2,564	6.990	.02	.05
8-5-8	1,024	8,832	.01	.06
8-6-4	6,908	7,495	.05	.05
8-6-6	4,004	4,828	.02	.03
8-6-8	20,456	17,449	.14	.12
8-6-10	694	4,810	(2/)	.04
8-8-2	2,518	4,202	.02	.03
8-8-4	16,218	15,536	.12	.10
8-8-8	207,987	221,474	1.43	1.54
8-9-10	8,164	10,699	.06	.08
8-10-12	11,169	9,230	.07	.06
8-12-0	2,712	4,829	.02	.03
8-12-12	55,748	59,701	.39	.42
8-12-16	16,119	9,238	.11	.06
8-16-8	6,189	5,920	.04	.04
8-16-16	140,341	166,068	.97	1.16
8-24-0	5,479	10,220	.03	.07
8-24-8	72,908	62,403	.51	.43
8-24-12	13,576	18,643	.09	.13
8-32-0	60,377	56,439	.42	.39
9-6-6	10,609	14,459	.07	.10
9-9-9	10,906	16,605	.07	.12
9-12-12	0	11,644	0	.08
9-36-0	3,006	11,279	.02	.08
10-0-10	22,687	21,182	.16	.14
10-0-12	3,700	4,327	.02	.03
10-4-10	4,808	5,020	.03	.04
10-5-5	3,657	5,217	.03	.03
10-5-10	1,501	4,475	.01	.04
10-6-4	42,175	59,507	.29	.41
10-10-0	8,445	4,496	.06	.03
10-10-5	22,569	26,279	.15	.18
10-10-10	659,090	689,131	4.54	4.79
10-16-8	8,274	6,754	.06	.04
10-20-0	63,825	53,834	.44	.38
10-20-5	2,967	5,451	.02	.03
10-20-10	121,165	140,494	.83	.98
10-20-20	23,440	29,195	.16	.20
10-30-10	4,684	5,224	.04	.04
12-0-10	13,570	16,846	.09	.12
12-0-12	7,832	7,711	.06	.05
12-6-6	7,150	13,164	.05	.09
12-12-12	500,839	611,110	3.44	4.24
12-24-0	4,597	4,404	.03	.03
12-24-12	26,762	29,958	.19	.21
12-36-12	4,729	5,193	.03	.04
13-13-13	38,058	44,801	.26	.31
14-0-14	47,436	54,770	.33	.38
14-14-14	43,913	45,114	.30	.31
15-0-14	1,410	6,032	.01	.04
15-0-15	4,902	9,756	.04	.07
15-8-4	7,815	6,497	.05	.05
15-10-10	1,705	4,953	.01	.03
15-15-0	31,462	19,351	.22	.13
15-15-15	2,481	27,695	.01	.20
15-30-0	4,174	4,236	.03	.03
16-8-8	3,052	6,287	.02	.04
16-48-0	5,092	15,342	.04	.11
17-7-0	16,192	21,061	.11	.14
19-38-0	1,642	9,384	.01	.07
20-0-20	6,417	9,729	.04	.06
20-20-0	2,830	7,003	.02	.05
24-20-0	350	4,414	(2/)	.03
175 Listed grades	13,917,323	13,745,381	95.78	95.40
Other grades reported	3/ 414,040	4/ 317,969	2.85	2.21
Not reported by grade	197,796	343,961	1.37	2.39
Total	5/ 14,529,159	5/ 14,407,311	100.00	100.00

1/ Grades consumed in amounts of 4,000 tons or more in year ended June 30, 1957 and their consumption in year ended June 30, 1956. 2/ Less than 0.005 percent. 3/ 1,231 grades. 4/ 1,335 grades. 5/ Does not include the quantity of mixtures consumed in the Territories.

Table 5. Mixtures consumed in states and regions, by grade, year ended June 30, 1957

Consumption of 15 principal grades in indicated region, Tons

New England

State	8-12-12	5-10-10	10-10-10	8-16-16	6-9-12	0-20-20	5-10-5	8-9-10	6-3-6	5-8-7	8-12-16	0-15-30	7-7-7	6-10-4	6-8-8	Other grades No.1/	Other grades Tons2/	Total tons
Maine	52,012	9,521	17,358	16,172	24,754	2,092	380	10,699	0	1,863	9,203	191	169	224	0	47	18,671	163,309
New Hampshire	919	2,406	2,378	4,993	13	498	136	0	0	656	0	1,208	548	339	0	27	1,033	15,127
Vermont	422	6,109	5,519	7,096	0	13,925	40	0	0	107	0	2,568	307	31	0	30	1,897	38,021
Massachusetts	1,455	16,865	10,405	5,638	0	581	2,537	0	3,734	4,684	0	1,410	4,412	2,695	1,103	22	13,372	68,891
Rhode Island	199	7,768	1,024	192	0	230	234	0	0	439	0	296	622	649	97	26	3,209	14,959
Connecticut	1,531	9,614	8,800	2,890	0	1,108	8,865	0	6,901	1,887	0	3,011	2,240	1,768	3,272	60	11,099	62,986
Total	56,538	52,283	45,484	36,981	24,767	18,434	12,192	10,699	10,635	9,636	9,203	8,684	8,298	5,706	4,472	88	49,281	363,293

Middle Atlantic

State	5-10-10	5-10-5	10-10-10	3-12-6	8-16-16	0-20-20	6-12-12	3-12-12	2-12-12	6-12-6	4-8-12	4-12-12	6-10-4	0-14-14	5-10-15	Other grades No.1/	Other grades Tons2/	Total tons
New York	139,783	107,655	61,770	2,856	46,820	16,196	14,497	2,657	27	26,469	2,582	74	8,624	2,322	7,393	75	59,308	499,033
New Jersey	124,025	24,370	9,774	1,060	2,391	2,539	5,469	1,633	68	1,341	492	415	6,371	2,967	1,871	77	60,771	245,557
Pennsylvania	256,960	20,771	60,639	49,280	29,435	32,966	8,281	15,382	6,983	1,592	7,318	14,972	5,042	4,542	1,665	113	52,679	568,507
Delaware	38,216	1,068	8,041	726	3,822	2,042	2,443	933	5,005	5	570	1,940	147	2,739	7,157	69	8,034	82,888
Dist. of Col.	24	990	3	0	0	6	0	0	0	0	6	0	288	0	0	13	453	1,770
Maryland	99,293	27,081	21,140	28,067	5,650	6,124	2,149	9,413	15,473	30	14,855	5,505	1,060	5,350	1,394	96	33,083	275,667
West Virginia	34,190	2,491	3,763	8,377	295	6,159	544	416	2,852	58	3	60	700	2,399	86	47	9,768	72,161
Total	692,491	184,426	165,130	90,366	88,413	66,032	33,383	30,434	30,408	29,495	25,826	22,966	22,232	20,319	19,566	181	224,096	1,745,583

South Atlantic

State	4-12-12	3-9-9	5-10-10	2-12-12	4-8-8	3-9-6	4-8-6	5-10-5	4-7-5	4-10-6	6-8-6	6-6-6	8-8-8	4-8-10	3-12-12	Other grades No.1/	Other grades Tons2/	Total tons
Virginia	11,934	37,295	156,369	168,618	2	28,322	0	66,035	0	0	11,720	0	6,875	6,785	0	43	173,376	667,331
North Carolina	15,850	266,853	303,947	148,212	11	144,053	0	16,880	0	2,930	51,057	0	30,457	47,403	7	28	188,049	1,215,709
South Carolina	63,036	145,415	27,904	0	20,203	17,331	0	35,934	0	102,558	4,733	0	6,336	2	73,081	32	69,459	565,992
Georgia	601,431	72,011	7,325	13,735	101,278	996	106,290	3,601	0	24	26,512	0	5,008	5	452	99	109,065	1,047,733
Florida	34,285	5,995	5,666	5,913	75,193	0	36,493	6,738	118,792	444	5,539	94,771	40,799	32,199	2,438	957	850,376	1,315,641
Total	726,536	527,569	501,211	336,478	196,687	190,702	142,783	129,188	118,792	105,956	99,561	94,771	89,475	86,394	75,978	994	1,390,325	4,812,406

East North Central

State	3-12-12	5-20-20	4-16-16	12-12-12	10-10-10	0-20-20	5-10-10	3-9-27	0-10-30	3-18-9	6-24-24	6-24-12	6-12-12	10-6-4	8-32-0	Other grades No.1/	Other grades Tons2/	Total tons
Ohio	337,889	116,325	51,367	86,889	65,491	32,134	102,643	1,135	1,103	17,904	3,061	10,489	12,532	12,111	843	131	101,112	953,028
Indiana	112,225	170,880	208,661	97,638	88,950	41,584	2,896	17,864	10,253	4,241	9,023	4,085	4,111	2,255	18,571	130	89,954	883,191
Illinois	68,341	54,191	94,201	53,494	80,411	19,867	300	20,908	4,065	652	8,339	2,064	3,707	2,156	5,712	108	95,428	513,836
Michigan	108,110	116,117	93,137	82,541	34,010	12,561	3,629	3,121	3,151	12,831	1,589	13,641	7,238	11,587	594	89	73,953	577,810
Wisconsin	54,133	104,376	43,498	7,183	30,089	33,588	0	16,240	26,822	780	13,838	362	2,298	304	424	76	55,517	389,452
Total	680,698	561,889	490,864	327,745	298,951	139,734	109,468	59,268	45,394	36,408	35,850	30,641	29,886	28,413	26,144	240	415,964	3,317,317

West North Central

State	12-12-12	5-20-20	6-24-12	10-10-10	8-24-8	3-12-12	5-20-10	0-20-20	10-20-0	4-16-16	8-32-0	4-12-4	8-8-8	8-24-12	10-20-10	Other grades No.1/	Other grades Tons2/	Total tons
Minnesota	5,902	86,950	67,313	10,015	0	690	5,406	16,873	2,142	15,241	6,617	0	55	16,945	219	103	91,723	326,091
Iowa	20,999	94,370	3,088	33,760	409	9,696	41,498	9,150	10,493	7,438	10,362	35	31	112	3,183	212	62,837	307,461
Missouri	177,609	16,243	0	13,811	35,359	40,971	0	15,812	26	6,116	1	23,725	25,596	0	5,128	57	82,091	442,488
North Dakota	337	570	3,049	55	0	45	0	54	154	103	1,974	0	0	1,407	75	52	22,186	30,009
South Dakota	37	19	389	147	0	0	0	34	2,402	6	2,925	0	0	13	32	40	3,726	9,730
Nebraska	601	521	157	216	359	9	760	534	4,050	0	4,439	18	5	0	1,891	83	11,159	24,719
Kansas	3,289	373	20	891	19,962	571	32	635	12,026	53	1,459	3,092	295	0	5,290	49	31,633	79,621
Total	208,774	199,046	74,016	58,895	56,089	51,982	47,696	43,092	31,293	28,957	27,777	26,870	25,982	18,477	15,818	283	305,355	1,220,119

(Continued)

East South Central

State	4-10-7	6-12-12	6-8-8	4-12-12	5-10-15	4-12-8	5-10-5	0-14-14	3-9-6	3-12-12	0-16-8	10-10-10	5-10-10	8-8-8	6-8-6	Other grades No.1/	Other grades Tons2/	Total tons
Kentucky	0	24,123	20	359	95,776	99,460	2,070	210	13,422	39,452	0	30,802	15,213	1,344	26,107	98	88,636	436,994
Tennessee	591	247,790	1,727	1,216	14,952	6,642	4,332	343	46,956	8,157	78	4,062	12,725	2,039	1,352	88	70,640	423,602
Alabama	314,420	24	71,898	192,405	0	0	660	71,270	0	0	40,473	3,954	1	14,223	29	53	40,186	749,543
Mississippi	5,707	2,379	139,775	14	0	0	81,996	4,646	0	2,018	615	1,050	11,124	10,094	27	42	42,007	301,452
Total	320,718	274,316	213,420	193,994	110,728	106,102	89,058	76,469	60,378	49,627	41,166	39,868	39,063	27,700	27,515	166	241,469	1,911,591

West South Central

State	5-10-5	10-20-10	8-8-8	12-12-12	12-24-12	3-12-12	4-12-4	10-20-0	6-8-12	13-13-13	6-24-24	5-20-20	6-8-8	0-20-20	5-10-10	Other grades No.1/	Other grades Tons2/	Total tons
Arkansas	32,233	21,399	2,414	11,562	719	754	545	124	14,504	4,457	2,922	1,473	16	8,150	1,631	63	37,801	140,704
Louisiana	22,061	3,408	30,317	20,404	1,654	17,699	7,572	0	1,186	4,127	7,884	8,601	10,985	2,593	2,717	51	13,233	154,441
Oklahoma	20,003	17,846	243	479	2,665	273	2,070	5,703	4	269	409	325	39	75	930	63	10,668	62,001
Texas	95,005	69,113	13,175	5,785	16,118	809	5,997	10,044	27	6,747	1,709	2,247	111	233	2,819	124	45,389	275,328
Total	169,302	111,766	46,149	38,230	21,156	19,535	16,184	15,871	15,721	15,600	12,924	12,646	11,151	11,051	8,097	188	107,091	632,474

Mountain

State	10-20-0	20-20-0	10-20-5	24-20-0	6-10-4	20-10-0	10-20-10	18-9-0	10-18-5	10-10-10	10-10-0	10-16-8	14-14-14	6-30-0	12-12-12	Other grades No.1/	Other grades Tons2/	Total tons
Montana	2,037	260	0	0	150	43	1	0	285	0	0	0	50	566	0	19	515	3,907
Idaho	184	873	2	3,134	226	190	8	0	260	3	0	293	291	122	275	50	2,121	7,982
Wyoming	185	136	0	0	40	31	5	0	26	0	0	0	0	0	0	21	845	1,268
Colorado	497	226	0	0	250	185	368	0	889	187	0	1,087	299	59	380	64	6,298	10,725
New Mexico	87	334	26	0	19	3	130	0	0	15	58	0	0	0	19	24	889	1,580
Arizona	2,348	3,996	4,085	9	230	1,786	1,766	1,657	0	1,118	1,347	0	349	0	0	53	5,945	24,636
Utah	531	0	0	813	2,309	0	0	0	123	0	0	4	0	61	31	32	1,052	4,924
Nevada	63	0	0	0	681	45	0	0	0	202	3	0	40	0	0	18	334	1,368
Total	5,932	5,825	4,113	3,956	3,905	2,283	2,278	1,657	1,583	1,525	1,408	1,384	1,029	808	705	152	17,999	56,390

Pacific

State	10-10-10	10-10-5	17-7-0	6-10-4	8-8-4	4-4-2	8-10-12	15-8-4	10-16-8	10-20-20	6-20-20	8-12-0	5-3-2	5-10-10	6-9-6	Other grades No.1/	Other grades Tons2/	Total tons
Washington	931	108	1	3,321	0	0	0	0	132	3,461	1,638	973	4,422	3,052	0	86	18,842	36,881
Oregon	368	2	0	3,380	0	0	3	5	5,230	1,561	3,309	3,831	230	913	0	65	10,679	29,511
California	24,619	23,252	20,791	7,339	12,658	8,049	7,274	6,434	0	0	0	0	0	0	3,752	3/ 5	167,578	281,746
Total	25,918	23,362	20,792	14,040	12,658	8,049	7,277	6,439	5,362	5,022	4,947	4,804	4,652	3,965	3,752	115	197,099	348,138

Territories4/

State	14-4-10	9-10-5	14-2-8	15-4-7	10-10-8	12-4-10	13-3-12	12-6-10	8-6-10	12-3-16	6-8-10	10-6-20	16-4-5	5-7-20	12-2-10	Other grades No.1/	Other grades Tons2/	Total tons
Puerto Rico	47,975	41,755	18,997	18,215	11,303	10,012	9,533	9,313	8,522	8,348	7,468	7,365	4,375	4,160	3,855	27	18,872	230,068

Continental United States

State	5-10-10	4-12-12	3-12-12	5-20-20	10-10-10	12-12-12	5-10-5	3-9-9	4-16-16	6-12-12	2-12-12	4-10-7	0-20-20	6-8-8	3-9-6	Other grades No.1/	Other grades Tons2/	Total tons
New England	52,283	0	321	0	45,484	3,960	12,192	0	0	2,051	5	0	18,434	4,472	0	94	224,091	363,293
Mid. Atlantic	692,491	22,966	30,434	593	165,130	13,504	184,426	446	950	33,383	30,408	0	66,032	0	4	183	504,816	1,745,583
So. Atlantic	501,211	726,536	75,978	584	49,262	3,825	129,188	527,569	186	18,530	336,478	41,715	3,590	49,390	190,702	179	2,157,662	4,812,406
E. No. Cent.	109,468	5,386	680,698	561,889	298,951	327,745	12,322	359	490,864	29,886	0	0	139,734	0	0	244	660,018	3,317,317
W. No. Cent.	1,113	416	51,982	199,046	58,895	208,774	7,085	0	28,957	11,408	0	0	43,092	5	0	287	609,346	1,220,119
E. So. Cent.	39,063	193,994	49,627	12,535	39,868	13,184	89,058	567	6,855	274,316	3,881	320,718	21,962	213,420	60,378	166	572,165	1,911,591
W. So. Cent.	8,097	90	19,535	12,646	4,098	38,230	169,302	21	0	1,913	0	0	11,051	11,151	0	192	356,340	632,474
Mountain	15	45	0	5	1,525	705	484	0	0	0	0	0	40	0	0	160	53,571	56,390
Pacific	3,965	0	0	26	25,918	1,183	573	0	0	82	621	0	579	0	0	121	315,191	348,138
Total	1,407,706	949,433	908,575	787,324	689,131	611,110	604,630	528,959	527,812	371,569	371,393	362,433	304,514	278,438	251,084	1,495	5,453,200	14,407,311

1/ Exclusive of mixtures not reported by grade. 2/ Including the tonnage of mixtures not reported by grade. 3/ Total number of mixtures ranges over 500 but only 14 reported by grade.
4/ Total consumption in Hawaii was 65,428 tons of mixtures, comprising 138 grades, which were manufactured to consumer's specifications.

average content of each of the nutrients showed an increase in each State. The average grade of mixture consumed in the Pacific region contained 11.9 percent less K_2O in 1956–57 than in the preceding year.

MATERIALS

In 1956–57 the total consumption of materials for direct application amounted to 8,006,204 tons (table 8) which represented 35.3 percent of all fertilizers used compared with 33.4 percent for the preceding year. In 1956–57 the quantity of materials consumed was 587,887 tons (7.9 percent) more than the revised amount (7,418,317 tons) used in 1955–56. There were 168 grades and types of materials reported. The changes in consumption of the individual classes of materials have been summarized in table 9.

Compared with the previous year, the principal changes in consumption of the direct application materials were in the chemical nitrogen materials. Changes have been shown for the individual products of this class in table 10.

While there are variations in the changes in consumption of individual products and in States, the regional total use of chemical nitrogen materials was from 5 to nearly 52 percent higher in 1956–57 than for the previous year. Of the individual products the highest proportional use (125.8 percent) was in nitrogen solutions. In the South Atlantic region which has been slow in adopting liquid fertilizers of all kinds, the use of nitrogen solutions increased from 27,158 tons in 1955–56 to 75,941 tons in 1956–57. The uses of ammonium sulfate and ammonium nitrate were notably higher in 1956–57. The uses of ammonium sulfate increased in the East North Central region, particularly in Illinois and Indiana; while that of ammonium nitrate increased in all areas except the Pacific region and Hawaii where slight decreases occurred. The use of anhydrous ammonia increased nationally by only 8 percent. The national use of aqua ammonia increased 23.1 percent being confined generally to the Mountain and Pacific regions and Hawaii where this product is principally used. The uses of ammonium nitrate-limestone mixtures, calcium cyanamide, calcium nitrate, and sodium nitrate were generally lower in areas where principally used. Although over-all consumption of urea increased, there were many areas showing decreases; while in these same areas the use of other chemical nitrogen products was higher.

In 1956–57 the total consumption of phosphate materials decreased by 62,352 tons (2.5 percent) from that consumed in 1955–56. The principal changes were in the use of colloidal and phosphate rock which was 94,731 tons (10.2 percent) lower, with decreases of 52,786 tons in Illinois and 35,339 tons in Missouri accounting for most of the change. The 22 percent and under grades of superphosphate decreased 47,028 tons (7.7 percent) from the use of 1955–56 with the East South Central, West North Central, and Mountain regions showing the least change. However, the use of grades of superphosphate containing over 22 percent P_2O_5 increased 48,246 tons (14.8 percent). It appeared that more superphosphate was used rather than higher grades being substituted for lower grades.

Most of the potash materials used for direct application showed an increase in

Table 6. Ratios of primary nutrients of mixtures consumed in largest tonnage in continental United States, years ended June 30, 1956 and 1957

Nutrient ratio[1]	Consumption 1956 Tons	Consumption 1957 Tons	Proportion of quantity of all mixtures 1956 Per cent	Proportion of quantity of all mixtures 1957 Per cent
1:4:4	2,531,259	2,287,069	17.4	15.8
1:2:2	2,017,107	2,185,187	13.9	15.2
1:1:1	1,578,374	1,783,217	10.9	12.4
1:3:3	1,230,328	1,490,491	8.5	10.3
1:2:1	891,471	836,800	6.1	5.8
0:1:1	563,484	542,682	3.9	3.8
1:3:2	518,145	403,194	3.6	2.8
1:6:6	400,812	371,395	2.7	2.6
4:10:7	470,518	362,853	3.2	2.5
1:4:2	319,089	326,880	2.2	2.3
Total	10,520,587	10,589,768	72.4	73.5

[1] N:available P_2O_5:K_2O.

Table 7. Primary plant nutrients consumed in mixtures and in materials, as a weighted average, year ended June 30, 1957[1]

Percent

State and region	Mixtures 2/ N	Mixtures 2/ Available P_2O_5	Mixtures 2/ K_2O	Mixtures 2/ Total	Materials: Single nutrient 3/ N	Materials: Single nutrient 3/ Available P_2O_5 4/	Materials: Single nutrient 3/ K_2O	Materials: Multiple nutrient 2/	Materials: Total nutrients	Total in mixtures and materials
Maine	7.56	11.76	12.68	32.00	32.64	19.92	48.57	10.82	26.12	31.69
New Hampshire	6.53	13.08	14.07	33.68	29.17	20.43	58.28	11.66	23.44	31.43
Vermont	4.19	15.74	16.86	36.79	34.29	20.57	60.52	14.06	22.10	32.18
Massachusetts	6.82	10.04	10.57	27.43	17.70	19.87	61.19	11.22	17.04	25.32
Rhode Island	5.92	10.54	10.56	27.02	20.38	18.65	58.33	9.02	16.42	25.80
Connecticut	6.29	10.10	10.01	26.40	25.48	21.53	54.61	12.67	18.07	24.30
New England	6.74	11.56	12.22	30.52	25.60	20.56	57.20	11.96	20.07	28.81
New York	6.53	12.22	10.09	28.84	26.53	22.57	51.55	10.49	23.19	28.07
New Jersey	5.46	10.60	10.30	26.36	24.37	21.32	53.68	11.82	21.51	25.95
Pennsylvania	5.36	12.18	11.94	29.48	29.86	20.55	52.14	12.59	22.92	28.82
Delaware	5.13	11.70	12.46	29.29	29.97	22.77	60.97	12.55	29.38	29.29
District of Columbia	5.99	10.06	5.14	21.19	10.89	20.39	60.37	9.61	10.05	17.70
Maryland	4.58	11.23	10.37	26.18	29.14	17.65	44.47	13.31	24.28	26.08
West Virginia	4.51	12.04	10.70	27.25	24.48	21.56	60.86	9.03	22.37	26.65
Middle Atlantic	5.54	11.79	10.90	28.23	27.31	21.33	51.65	11.57	23.04	27.71
Virginia	4.02	11.08	10.94	26.04	23.27	26.17	15.32	16.34	21.75	25.55
North Carolina	4.21	9.54	9.92	23.67	24.36	17.05	38.85	14.90	24.70	23.88
South Carolina	3.98	9.93	9.69	23.60	21.02	15.31	58.57	18.61	23.65	23.61
Georgia	4.83	10.41	10.70	25.94	25.87	16.74	57.69	29.90	26.23	25.99
Florida	5.86	6.90	8.57	21.33	23.53	7.42	51.31	16.15	18.92	21.07
South Atlantic	4.74	9.27	9.84	23.85	23.68	14.05	41.13	17.31	23.62	23.81
Ohio	5.32	14.32	13.55	33.19	33.00	24.13	56.52	19.95	30.76	33.01
Indiana	5.63	16.43	15.72	37.78	36.38	20.42	60.17	42.08	40.79	38.34
Illinois	6.57	15.09	14.39	36.05	32.99	7.79	60.90	26.55	18.07	24.82
Michigan	6.17	15.57	14.80	36.54	39.00	19.69	52.45	13.19	28.88	35.85
Wisconsin	4.17	16.15	19.48	39.80	47.31	22.24	58.99	15.36	38.72	39.69
East North Central	5.61	15.44	15.17	36.22	35.09	9.54	60.19	20.56	23.78	32.84
Minnesota	5.67	21.88	15.20	42.75	53.75	41.86	58.59	45.71	47.98	43.97
Iowa	6.73	18.35	13.27	38.35	45.81	28.16	60.10	41.82	38.01	38.24
Missouri	8.60	14.63	12.58	35.81	39.48	6.54	60.20	21.27	20.49	28.94
North Dakota	11.37	27.59	5.36	44.32	40.50	45.29	60.12	49.25	47.62	46.41
South Dakota	11.24	24.62	1.63	37.49	43.30	43.45	60.37	45.37	44.22	41.56
Nebraska	9.99	22.50	4.26	36.75	55.06	43.82	60.39	54.87	52.93	50.57
Kansas	10.91	24.09	5.45	40.45	39.65	42.12	60.43	41.26	40.98	40.78
West North Central	7.62	18.68	12.56	38.86	46.22	21.35	59.84	44.50	35.76	37.49
Kentucky	4.89	11.85	12.04	28.78	34.83	22.46	53.80	35.85	31.94	29.39
Tennessee	5.42	11.96	11.40	28.78	34.99	30.12	34.92	36.49	34.06	29.95
Alabama	3.72	11.18	9.75	24.65	25.11	12.56	60.15	38.19	23.02	24.20
Mississippi	5.97	9.89	8.53	24.39	37.14	13.19	60.18	32.32	31.16	28.43
East South Central	4.72	11.30	10.44	26.46	32.70	16.02	50.74	36.37	29.17	27.37
Arkansas	6.48	14.27	13.42	34.17	36.34	38.59	60.11	38.92	40.44	37.74
Louisiana	6.73	14.52	10.79	32.04	39.88	16.73	59.21	32.55	37.24	34.46
Oklahoma	8.00	17.36	7.04	32.40	38.59	25.68	58.00	40.50	32.21	32.32
Texas	8.10	16.71	7.84	32.65	47.82	29.22	55.20	38.62	40.97	37.10
West South Central	7.40	15.70	9.72	32.82	41.77	28.14	59.71	38.68	39.50	36.29
Montana	11.08	20.40	1.13	32.61	37.89	43.73	60.06	47.31	42.65	41.75
Idaho	17.58	18.89	2.68	39.15	30.69	41.79	60.89	41.86	36.09	36.41
Wyoming	12.85	18.93	2.52	34.30	50.73	44.47	60.40	61.24	48.89	47.12
Colorado	12.13	19.67	7.38	39.18	40.84	45.31	46.75	51.17	43.95	43.08
New Mexico	11.90	15.82	3.48	31.20	53.09	34.88	49.08	43.99	43.00	42.51
Arizona	13.91	16.96	3.39	34.26	37.25	36.36	53.08	29.87	35.22	38.35
Utah	10.64	14.42	3.80	28.86	32.50	39.13	60.32	35.75	35.58	34.55
Nevada	8.26	10.45	4.82	23.53	24.45	42.37	52.64	33.30	29.33	27.50
Mountain	13.39	17.62	3.94	34.95	37.40	40.86	51.44	36.87	38.35	37.91
Washington	8.36	12.74	8.71	29.81	37.63	34.40	54.98	35.21	37.49	35.82
Oregon	8.59	16.12	8.87	33.58	27.69	22.26	57.98	37.80	29.63	30.21
California	10.92	10.21	5.61	26.54	29.86	26.48	55.20	13.24	23.54	24.16
Pacific	10.29	10.98	6.21	27.48	30.50	26.86	55.57	15.80	25.62	26.00
Continental U. S.	5.61	12.47	11.45	29.54	33.00	17.87	55.03	24.05	28.85	29.32
Hawaii	11.74	8.90	17.01	37.65	24.44	24.07	59.28	56.79	29.83	32.50
Puerto Rico	11.76	5.88	9.51	27.15	22.04	23.90	55.88	21.35	22.20	26.12
Territories	11.76	6.55	11.17	29.48	23.52	24.05	59.24	50.27	27.37	28.66
U. S. Average:										
1956-57	5.74	12.36	11.44	29.54	32.62	17.92	55.20	24.14	28.81	29.30
1955-56	5.39	12.08	11.20	28.67	5/ 32.36	16.55	55.64	22.71	5/ 27.44	28.29
1954-55	5.24	11.86	10.80	27.90	31.00	19.37	54.56	21.64	27.88	27.90

1/ Excluding fertilizers not guaranteed to contain one or more of the primary plant nutrients, N, P_2O_5, or K_2O. 2/ Guaranteed to contain two or more of the primary plant nutrients. 3/ Guaranteed to contain one of the primary plant nutrients. 4/ Including 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application. 5/ Revised.

Table 8. Materials for direct application consumed, by class and product year ended June 30, 1957[1]

Tons

State and region	Chemical nitrogen materials: Ammonia (anhydrous)	Ammonium nitrate	Ammonium nitrate-limestone mixtures	Ammonium sulfate	Calcium cyanamide	Nitrogen solutions and aqua ammonia[2]	Sodium nitrate	Urea	Other[2]	Natural organics[2]	Phosphate materials[2]: Phosphate rock[3]	Superphosphates: Grades 22 percent and under	Superphosphates: Grades over 22 percent	Other	Potash materials: Chlorides 50-60 percent grades	Other[2]	Total primary nutrient materials	Secondary and trace nutrient materials[2]
Maine	0	3,484	3	97	223	2	174	391	1	762	45	3,309	0	110	103	72	8,776	30
New Hampshire	0	780	11	8	233	99	64	153	0	754	0	1,926	7	87	122	9	4,253	9
Vermont	0	787	37	20	10	109	45	176	0	129	52	15,700	5	31	271	0	17,372	19
Massachusetts	0	1,373	0	149	347	13	748	175	33	9,497	112	3,774	10	672	644	21	17,568	271
Rhode Island	0	90	0	8	220	0	34	67	9	1,062	18	293	0	45	68	4	1,918	9
Connecticut	0	882	10	51	308	1	427	266	23	12,022	108	5,202	35	604	648	728	21,315	52
New England	0	7,396	61	333	1,341	224	1,492	1,228	66	24,226	335	30,204	57	1,549	1,856	834	71,202	390
New York	559	12,917	636	412	3,231	923	4,031	786	331	14,922	788	31,699	3,983	773	1,112	1,277	78,380	663
New Jersey	513	2,451	300	88	2,039	316	2,445	419	87	6,764	326	3,719	1,059	1,435	687	170	22,818	131
Pennsylvania	585	8,168	70	2,927	1,232	317	1,375	1,053	285	8,878	3,442	28,227	2,864	1,415	1,278	854	62,970	2,845
Delaware	30	1,258	74	10	613	468	102	95	1	517	200	486	125	152	364	5	4,500	185
District of Columbia	0	4	0	2	0	0	6	0	7	736	0	13	0	37	1	0	806	6
Maryland	413	1,939	438	38	1,668	931	1,334	294	10	1,639	1,600	3,621	33	777	585	409	15,729	1,035
West Virginia	0	1,118	89	312	16	0	1,334	110	1	423	52	6,316	134	139	124	3	10,171	42
Middle Atlantic	2,100	27,855	1,607	3,789	8,799	2,955	10,627	2,757	722	33,879	6,408	74,081	8,198	4,728	4,151	2,718	195,374	4,907
Virginia	1,109	6,682	22,725	910	1,189	6,088	18,339	633	151	1,749	755	6,725	56	2,209	2,966	15,478	87,764	16,768
North Carolina	8,446	18,821	109,681	311	3,932	36,269	77,124	999	226	3,160	958	13,986	0	7,288	10,237	10,350	301,788	49,800
South Carolina	2,135	25,337	76,625	193	818	17,572	80,551	153	0	881	556	14,318	158	7,989	18,925	1,888	248,099	3,975
Georgia	8,403	53,091	42,684	1,295	874	8,969	69,380	182	248	1,909	199	11,295	163	8,069	6,328	1,232	214,321	31,388
Florida	1,727	18,327	4,395	2,971	2,949	7,043	35,137	3,458	7,785	13,685	26,202	8,566	234	3,848	2,105	17,341	155,773	5,704
South Atlantic	21,820	122,258	256,110	5,680	9,762	75,941	280,531	5,425	8,410	21,384	28,670	54,890	611	29,403	40,561	46,289	1,007,745	107,635
Ohio	2,865	14,837	15	13,497	533	4,288	848	2,874	87	7,268	4,673	14,598	5,726	3,077	6,074	1,051	82,311	358
Indiana	10,024	40,152	38	13,877	646	22,296	139	6,758	30	2,164	20,463	5,689	13,873	4,059	61,422	1,790	203,420	295
Illinois	14,727	54,176	721	60,399	115	5,725	11	1,460	67	12,600	517,508	37,198	41,613	12,891	95,673	157	855,041	85
Michigan	3,609	9,350	31	4,115	77	5,880	290	2,290	63	13,458	2,718	8,281	1,684	1,849	2,834	1,111	57,640	1,245
Wisconsin	3,317	6,052	0	227	12	2,246	0	391	17	5,458	3,966	2,371	1,808	1,728	8,764	627	36,984	41
East North Central	34,542	124,567	805	92,115	1,383	40,435	1,288	13,773	264	40,948	549,328	68,137	64,704	23,604	174,767	4,736	1,235,396	2,024
Minnesota	12,503	8,820	113	266	0	10,738	0	497	59	3,141	1,485	6,502	29,744	16,645	8,615	586	99,714	342
Iowa	15,009	33,486	0	468	40	10,740	0	1,374	68	1,842	9,908	37,498	22,099	15,585	9,528	69	157,714	3,037
Missouri	15,360	83,939	0	2,180	0	11,201	66	373	39	3,740	200,773	2,995	8,702	7,731	22,054	339	359,492	296
North Dakota	235	1,101	0	85	0	49	0	73	0	69	0	50	17,770	32,279	25	0	51,736	0
South Dakota	654	2,535	0	55	0	44	0	192	12	288	80	517	4,301	6,161	6	0	14,845	0
Nebraska	45,508	35,208	13	2,134	0	20,203	0	3,878	93	247	446	1,886	24,906	10,040	393	16	144,971	42
Kansas	7,655	48,900	0	1,647	1	253	1	988	16	790	1,006	1,506	31,747	36,111	1,479	7	132,107	120
West North Central	96,924	213,989	126	6,835	41	53,228	67	7,375	287	10,117	213,698	50,954	139,269	124,552	42,100	1,017	960,579	3,837
Kentucky	2,196	32,789	17	564	1,573	1,525	1,657	147	0	575	12,951	26,482	1,384	7,933	8,771	6,499	105,063	169
Tennessee	8,930	44,188	251	464	1,219	56	17,601	39	2	1,198	702	9,376	4,499	9,954	11,525	11,272	121,276	235
Alabama	3,497	80,044	32,889	3,641	1,012	263	79,544	164	3	608	2,936	24,189	839	48,670	9,566	26	287,891	1,930
Mississippi	42,827	171,050	6,845	960	5,592	7,268	51,693	822	23	229	3,526	41,212	1,678	87,599	23,431	232	444,987	66
East South Central	57,450	328,071	40,002	5,629	9,396	9,112	150,495	1,172	28	2,610	20,115	101,259	8,400	154,156	53,293	18,029	959,217	2,400
Arkansas	17,862	68,920	110	5,630	5,163	5,804	24,875	6,857	35	36	313	5,598	11,517	2,739	29,709	365	185,533	1
Louisiana	24,895	41,736	353	9,693	1,045	6,427	20,815	935	373	363	3,764	11,160	1,361	5,326	5,642	87	133,975	150
Oklahoma	1,329	5,727	0	1,114	0	188	402	224	0	1,353	2,174	16,320	6,610	10,216	404	27	46,088	34
Texas	61,750	23,415	0	59,267	608	6,883	1,545	5,461	2	6,441	5,458	44,233	28,195	72,057	1,644	251	317,210	2,853
West South Central	105,836	139,798	463	75,704	6,816	19,302	47,637	13,477	410	8,193	11,709	77,311	47,683	90,338	37,399	730	682,806	3,038
Montana	1,963	6,000	0	3,192	0	513	0	149	16	164	0	40	19,425	8,079	50	5	39,596	417
Idaho	3,041	11,114	57	10,593	0	9,874	0	411	199	172	0	2,558	17,743	11,865	218	0	67,845	9,566
Wyoming	1,115	1,418	0	288	0	16	0	342	0	0	0	0	4,478	1,487	31	0	9,175	0
Colorado	3,596	12,175	0	3,091	6	913	0	2,774	246	1,393	0	1,258	14,493	7,087	437	485	47,954	498
New Mexico	5,461	1,611	0	3,262	0	0	0	2,966	1	386	0	7,422	9,883	4,824	129	89	36,034	30
Arizona	16,321	6,816	1,060	29,853	1,044	10,627	534	14,598	9,199	11,843	0	5,414	3,754	31,039	52	962	143,116	10,351
Utah	1,254	5,314	0	5,024	0	398	0	447	416	812	0	3,087	6,603	3,833	52	0	27,240	153
Nevada	35	241	0	907	1	442	42	22	3	130	0	3	339	810	0	2	2,977	2,760
Mountain	32,786	44,689	1,117	56,210	1,051	22,783	576	21,709	10,080	14,900	0	19,782	76,718	69,024	969	1,543	373,937	23,775
Washington	23,137	22,306	222	11,295	109	41,644	143	1,209	1,208	3,603	444	4,551	6,029	13,301	2,042	1,219	132,462	15,232
Oregon	6,023	26,062	73	43,524	1,181	39,734	3	4,009	3,792	1,318	45	10,623	1,030	32,384	1,714	159	171,674	16,884
California	71,180	48,205	0	152,964	7,099	249,941	174	21,866	30,089	[4] 318,442	1,074	61,332	16,600	99,692	2,149	5,068	1,085,875	760,517
Pacific	100,340	96,573	295	207,783	8,389	331,319	320	27,084	35,089	323,363	1,563	76,506	23,659	145,377	5,905	6,446	1,390,011	792,633
Continental U. S.	451,798	1,105,196	300,586	454,078	46,978	555,299	493,033	94,000	55,356	479,620	831,826	553,124	369,299	642,731	361,001	82,342	6,876,267	940,639
Hawaii	0	0	0	9,920	0	68,108	125	14,315	42	51	4,357	5,229	4,420	2,551	15,051	2,261	126,430	2,578
Puerto Rico	904	0	0	52,185	0	3,903	1	601	0	0	0	1,645	250	531	117	127	60,264	26
Territories	904	0	0	62,105	0	72,011	126	14,916	42	51	4,357	6,874	4,670	3,082	15,168	2,388	186,694	2,604
Total: 1956-57	452,702	1,105,196	300,586	516,183	46,978	627,310	493,159	108,916	55,398	479,671	836,183	559,998	373,969	645,813	376,169	84,730	7,062,961	943,243
1955-56	[5] 419,354	940,666	313,928	414,398	65,818	418,843	542,804	92,373	64,668	472,706	930,914	607,006	325,723	614,652	322,411	82,428	[5] 6,628,712	789,605
1954-55	353,681	1,115,358	358,023	519,968	68,882	340,574	615,842	68,585	59,254	461,100	604,653	685,722	341,940	592,340	318,657	82,427	6,587,006	791,606

1/ Includes 15,292 tons distributed by Government agencies for test demonstration. Excludes lime and the quantities used for manufacture of commercial mixtures. 2/ The principal kinds are shown separately in table 1, by regions. 3/ Includes colloidal phosphate the quantity of which is shown separately in table 1, by regions. 4/ Includes an estimated 250,000 tons of dried manures. 5/ Revised: 900 tons was added to Wyoming total.

1956–57 when compared with the consumption in the preceding year. The use of potassium-sodium nitrate appears to have decreased from 20,680 tons in 1955–56 to 9,373 tons in 1956–57, but this may be the result of some of this product having been reported as a mixture. The increase (9,561 tons) in use of mixtures corresponding to grades of this product would nearly account for the decreased tonnage. The use of the 58–62 percent grades of potassium chloride, which comprised 80 percent of the total consumption of potash materials, increased from 309,230 tons in 1955–56 to 370,531 tons in 1956–57 being most significant in the East North Central region and especially in the States of Indiana and Illinois.

The use of secondary and trace nutrient materials, except gypsum, sold through fertilizer manufacturers was relatively the same in both years. Use of gypsum, comprising 94 percent of the total tonnage of this class of products, increased from 738,499 tons in 1955–56 to 891,317 tons in 1956–57 adding 152,818 tons to the total increased tonnage (515,041 tons) of all fertilizers shown for 1956–57 season.

The weighted average primary nutrient content of the various classes of materials consumed was shown in table 7. These averages are based on the composition and tonnage of the individual materials comprising the respective classes. In 1956-57, the national averages of materials containing only N, P_2O_5, or K_2O, were 32.62, 17.92 (available P_2O_5), and 55.20 percent, respectively; of multiple-nutrient materials 24.14, and for all materials 28.81 per cent. The corresponding averages for these classes in 1955–56 were 32.36 (revised), 16.55, 55.64, 22.71, and 27.44 (revised) percent. The higher national averages for most of the classes in 1956–57 reflect generally the greater use of the higher analysis products. The lower average for K_2O results from the large increase in the tonnage of lime-potash which contains only 6 percent of K_2O.

PRIMARY PLANT NUTRIENTS

Fertilizers (mixtures and direct application materials) consumed in 1956–57 contained a total of 6,377,541 tons of N, available P_2O_5, and K_2O (table 11). Consumption of primary nutrients was 322,061 tons (5.3 percent) more than that (6,055,480 tons, revised) of 1955–56. In 1956–57 the primary nutrient content of fertilizers comprised 2,135,287 tons of N, 2,303,991 tons of available P_2O_5, 2,668,941 tons of total P_2O_5, and 1,938,263 tons of K_2O. Compared with the preceding year, consumption of these nutrients increased by 201,945 tons (10.4 percent) of N, 56,571 tons (2.5 percent) of available P_2O_5, 25,523 tons (1.0 percent) of total P_2O_5, and 63,545 tons (3.4 percent) of K_2O. The national weighted average of the total nutrient content of fertilizers containing these nutrients in 1956–57 was 29.30 percent as compared with 28.29 percent for the preceding year. Although the consumption of fertilizers containing these nutrients in 1956–57 was only 1.7 percent more than in 1955–56, the total quantity of primary nutrients was 5.3 percent more.

Mixtures comprised 67.6 percent of the total tonnage of primary nutrient fertilizers and supplied 39.5 percent of the N, 78.8 percent of the available P_2O_5, 72.1 percent of the total P_2O_5, and 86.8 percent of the K_2O. In the mixture used these nutrients were 5.9, 1.8, 1.4, and 1.7 percent higher than in the preceding year. While the tonnage of mixtures in 1956–57 was 0.5 percent lower than that in 1955–56, the total quantity of primary nutrients contained therein was 2.5 percent higher. It has been shown in table 7 that the national weighted average of the total nutrient content of mixtures in 1956–57 was 29.54 percent as compared with 28.67 percent for the preceding year. Total nutrients supplied by mixtures were proportionally higher from the lower tonnage of mixtures.

The tonnage of materials containing primary nutrients for direct application comprised 32.4 percent of the total tonnage of this class of fertilizer and supplied 60.5 percent of the N, 21.2 percent of the available P_2O_5, 27.9 percent of the total P_2O_5, and 13.2 percent of the K_2O. The quantities of N, available P_2O_5, and K_2O supplied by direct application materials were, respectively, 13.6, 5.4, and 16.4 percent higher (table 12) than in the preceding year, while that of total P_2O_5

was 0.3 percent lower. Although the tonnage of materials increased 6.6 percent over that in 1955–56, the total quantity of primary nutrients supplied thereby increased 11.9 percent. This is reflected in the national average of the total nutrient content of materials which was 28.81 percent in 1956–57 as compared with 27.44 percent (revised) for the preceding year. In 1956–57 the decrease in the tonnage of colloidal and phosphate rock was largely responsible for the decrease in the tonnage of total P_2O_5 supplied by materials. For the other classes of materials those supplying the major portion of the nutrients of their class were generally higher in 1956–57 than in the preceding year.

Though the national total of primary nutrients consumed was higher in 1956–57 than in 1955–56, of the 51 tabulated areas, there were decreases in the use of one or more of these nutrients supplied by either mixtures or materials in 39 (table 13). In 16 areas, however, the increase in the quantity of a nutrient supplied by either a mixture or a material was sufficiently higher to offset the decreased use of the respective nutrient in the other form. The remaining 23 areas are those in which the decrease in the nutrient in one category is not offset by an increase in the other category. Such areas showing decreases numbered for N, 7; available P_2O_5, 16; total P_2O_5, 19; and K_2O, 13. Although these areas are scattered through all parts of the United States, the greater concentration was in the southeastern part.

The national use of nitrogen increased 201,945 tons. Of this quantity, 154,992 tons (76.7 percent) was supplied by materials and 46,953 tons (23.3 percent) by mixtures. The increased consumption of nitrogen was largest in the West North Central region, followed by the South Atlantic, Pacific, and East North Central regions. While the consumption of nitrogen increased in all other regions, the quantity consumed in the form of materials in the East and West South Central regions increased but that used in mixtures decreased.

The national consumption of K_2O increased 63,545 tons—that used in materials by 36,036 tons, that in mixtures by 27,509 tons. The increased use was largely in the form of materials in the East North Central region (29,858 tons). In the South Atlantic region, the use in mixtures increased 15,083 tons and decreased 1,206 tons in materials. While consumption was generally higher in other areas, the use in both forms in the West South Central region was lower than in 1955–56.

The national use of available P_2O_5 increased 56,571 tons, while that of total P_2O_5 only 25,523 tons. The increased use of available P_2O_5 was largely in the West and East North Central regions. These areas accounted for 41,202 tons (72.8 percent) of the increased use and showed greater use in both mixtures and materials. While consumption of available P_2O_5 was higher in some of the remaining areas, total use in the South Atlantic and West South Central regions was 8,761 tons lower than in 1955–56. The change in consumption of total P_2O_5 was much smaller than that of the available P_2O_5 due largely to the decrease in use of phosphate rock in which the content of P_2O_5 is considered as 3 percent available, and total as 32 percent.

Table 9. Consumption of classes of materials, years ended June 30, 1956 and 1957, with comparisons

Class	Consumption 1956	Consumption 1957	Change in consumption	
	Tons	Tons	Tons	Per cent
Chemical nitrogen materials	3,272,852	3,706,428	433,576	13.2
Natural organic materials	472,706	479,671	6,965	1.5
Phosphate materials	2,478,315	2,415,963	−62,352	−2.5
Potash materials	404,839	460,899	56,060	13.8
Secondary and trace nutrient materials	789,605	943,243	153,638	19.5
Total	7,418,317	8,006,204	587,887	7.9

Table 10. Change in consumption of the principal kinds of chemical nitrogen materials in 1956–57 from quantity consumed in 1955–56

Kind	Change in consumption	
	Tons	Per cent
Ammonia, anhydrous	33,348	8.0
Ammonia, aqua	71,484	23.1
Ammonium nitrate	164,530	17.5
Ammonium nitrate-lime mixture	−13,342	−4.2
Ammonium sulfate	101,785	24.6
Calcium cyanamide	−18,840	−28.6
Calcium nitrate	−5,052	−9.1
Nitrogen solutions	136,983	125.8
Sodium nitrate	−49,645	−9.1
Urea	16,543	17.9
Other	−4,218	−46.4
Total	433,576	13.2

Table 11. Primary plant nutrients, consumed in mixtures and in mixtures and materials combined, year ended June 30, 1957

Tons

State and region	Consumption of nutrients in mixtures: N	P_2O_5 Available	P_2O_5 Total	K_2O	Total N, avail. P_2O_5, and K_2O	Consumption of nutrients in mixtures and materials: N	P_2O_5 Available 1/	P_2O_5 Total 2/	K_2O	Total N, avail. P_2O_5, and K_2O
Maine	12,342	19,197	19,955	20,702	52,241	13,817	19,911	20,697	20,805	54,533
New Hampshire	988	1,979	2,044	2,128	5,095	1,467	2,414	2,486	2,211	6,092
Vermont	1,593	5,983	6,163	6,411	13,987	2,014	9,236	9,518	6,577	17,827
Massachusetts	4,698	6,918	7,210	7,281	18,897	6,021	8,088	8,526	7,782	21,891
Rhode Island	885	1,576	1,659	1,579	4,040	1,054	1,666	1,768	1,635	4,355
Connecticut	3,963	6,365	6,679	6,304	16,632	5,295	8,049	8,492	7,140	20,484
New England	24,469	42,018	43,710	44,405	110,892	29,668	49,364	51,487	46,150	125,182
New York	32,568	60,991	64,856	50,370	143,929	40,614	69,780	74,203	51,709	162,103
New Jersey	13,409	26,025	26,813	25,304	64,738	16,237	27,579	28,496	25,831	69,647
Pennsylvania	30,485	69,239	71,891	67,864	167,588	35,949	77,007	80,911	69,062	182,018
Delaware	4,251	9,696	10,110	10,327	24,274	5,109	9,931	10,408	10,556	25,596
District of Columbia	106	178	190	91	375	146	213	228	97	456
Maryland	12,640	30,967	32,708	28,577	72,184	14,858	32,109	34,358	29,036	76,003
West Virginia	3,258	8,687	9,228	7,723	19,668	4,005	10,129	10,743	7,809	21,943
Middle Atlantic	96,717	205,783	215,796	190,256	492,756	116,918	226,748	239,347	194,100	537,766
Virginia	26,841	73,945	78,937	73,039	173,825	40,451	76,586	81,867	75,880	192,917
North Carolina	51,211	116,038	125,063	120,558	287,807	113,835	119,987	129,417	128,540	362,362
South Carolina	22,542	56,181	60,239	54,859	133,582	65,382	59,795	64,245	67,061	192,238
Georgia	50,637	109,114	115,643	112,104	271,855	98,856	112,813	119,597	116,408	328,077
Florida	77,047	90,752	110,386	112,755	280,554	99,434	94,163	121,498	116,434	310,031
South Atlantic	228,278	446,030	490,268	473,315	1,147,623	417,958	463,344	516,624	504,323	1,385,625
Ohio	50,748	136,517	143,278	129,168	316,433	64,553	143,953	152,357	133,249	341,755
Indiana	49,735	145,118	150,055	138,814	333,667	84,482	155,290	166,363	176,874	416,646
Illinois	33,759	77,539	80,937	73,943	185,241	80,290	126,996	281,825	132,437	339,723
Michigan	35,656	89,972	93,436	85,531	211,159	46,484	93,599	98,031	87,723	227,806
Wisconsin	16,226	62,883	65,007	75,846	154,955	22,448	65,401	68,708	81,425	169,274
East North Central	186,124	512,029	532,713	503,302	1,201,455	298,257	585,239	767,284	611,708	1,495,204
Minnesota	18,481	71,336	73,138	49,556	139,373	38,266	93,972	96,576	54,980	187,218
Iowa	20,695	56,433	58,865	40,808	117,936	50,484	80,809	86,716	46,593	177,886
Missouri	38,080	64,717	67,577	55,678	158,475	83,199	79,734	140,876	69,196	232,129
North Dakota	3,413	8,280	8,517	1,610	13,303	8,458	27,857	28,338	1,626	37,941
South Dakota	1,094	2,396	2,550	159	3,649	3,515	6,534	6,824	165	10,214
Nebraska	2,469	5,562	5,633	1,053	9,084	63,016	21,500	22,050	1,303	85,819
Kansas	8,687	19,179	19,378	4,343	32,209	37,734	43,360	44,654	5,249	86,343
West North Central	92,919	227,903	235,658	153,207	474,029	284,672	353,766	426,034	179,112	817,550
Kentucky	21,374	51,777	56,080	52,612	125,763	35,592	62,888	71,242	60,835	159,315
Tennessee	22,955	50,655	54,500	48,270	121,880	48,655	58,299	62,630	56,239	163,193
Alabama	27,880	83,815	89,564	73,058	184,753	78,505	93,696	101,046	78,835	251,036
Mississippi	18,004	29,826	32,038	25,699	73,529	124,680	47,569	52,238	39,943	212,192
East South Central	90,213	216,073	232,182	199,639	505,925	287,432	262,452	287,156	235,852	785,736
Arkansas	9,120	20,073	21,100	18,886	48,079	58,518	27,635	28,965	36,965	123,118
Louisiana	10,397	22,433	23,582	16,666	49,496	53,153	26,169	28,429	20,064	99,386
Oklahoma	4,957	10,767	11,229	4,363	20,087	9,968	20,338	21,681	4,624	34,930
Texas	22,305	46,007	47,950	21,573	89,885	109,398	87,719	92,190	22,740	219,857
West South Central	46,779	99,280	103,861	61,488	207,547	231,037	161,861	171,265	84,393	477,291
Montana	433	797	831	44	1,274	5,909	12,176	12,562	78	18,163
Idaho	1,403	1,508	1,719	214	3,125	14,392	12,872	13,231	348	27,612
Wyoming	163	240	255	32	435	2,007	2,863	2,933	51	4,921
Colorado	1,301	2,110	2,231	791	4,202	11,533	12,509	12,773	1,237	25,279
New Mexico	188	250	266	55	493	8,057	7,768	8,007	164	15,989
Arizona	3,428	4,179	4,354	834	8,441	41,794	15,520	15,880	1,539	58,853
Utah	525	710	762	187	1,422	5,194	5,696	5,943	224	11,114
Nevada	113	143	153	66	322	672	455	476	68	1,195
Mountain	7,554	9,937	10,571	2,223	19,714	89,558	69,859	71,805	3,709	163,126
Washington	3,082	4,698	4,910	3,212	10,992	43,941	11,696	12,139	5,020	60,657
Oregon	2,534	4,758	4,932	2,617	9,909	42,203	14,856	15,312	3,725	60,784
California	30,210	28,757	29,519	15,797	74,764	223,268	80,356	82,743	26,790	330,414
Pacific	35,826	38,213	39,361	21,626	95,665	309,412	106,908	110,194	35,535	451,855
Continental U. S.	808,879	1,797,266	1,904,120	1,649,461	4,255,606	2,064,912	2,279,541	2,641,196	1,894,882	6,239,335
Hawaii	7,685	5,820	6,021	11,131	24,636	30,597	10,365	11,922	21,394	62,356
Puerto Rico	27,062	13,539	15,272	21,869	62,470	39,778	14,085	15,823	21,987	75,850
Territories	34,747	19,359	21,293	33,000	87,106	70,375	24,450	27,745	43,381	138,206
Total: 1956-57	843,626	1,816,625	1,925,413	1,682,461	4,342,712	3/ 2,135,287	4/ 2,303,991	5/ 2,668,941	1,938,263	6,377,541
1955-56	796,673	1,785,073	1,897,790	1,654,952	4,236,698	6/ 1,933,342	2,247,420	2,643,418	1,874,718	6/ 6,055,480
1954-55	803,541	1,821,087	1,943,822	1,657,864	4,282,492	1,960,536	2,283,660	2,596,719	1,874,943	6,119,139

1/ Including 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application.
2/ Including 22 percent of the colloidal phosphate and 32 percent of the phosphate rock marketed for direct application.
3/ Including 2,630 tons in materials distributed by Government agencies for test demonstrations.
4/ Including 5,418 tons in materials distributed by Government agencies for test demonstrations.
5/ Including 5,470 tons in materials distributed by Government agencies for test demonstrations.
6/ Revised by addition of 739 tons of nitrogen to the Wyoming total.

Table 12. Primary plant nutrients consumed in direct-application materials, U. S. and territories

Material	Consumption, Year ended June 30, 1956	Consumption, Year ended June 30, 1957	Change	
	Tons	Tons	Tons	Percent
MATERIALS SUPPLYING NITROGEN		Nitrogen		
Ammonia, anhydrous	1/ 344,317	371,668	27,351	7.9
" , aqua	62,510	76,844	14,334	22.9
Ammonium nitrate	316,964	371,972	55,008	17.4
Ammonium nitrate-limestone mixtures	64,776	62,342	-2,434	-3.8
Ammonium sulfate	86,878	108,140	21,262	24.5
Bonemeal: raw and steamed	388	347	-41	-10.6
Calcium cyanamide	13,515	9,861	-3,654	-27.0
Calcium nitrate	8,630	7,796	-834	-9.7
Natural organics	13,204	13,133	-71	-.5
Nitrogen solutions	34,493	75,241	40,748	118.1
Phosphate products	56,588	62,568	5,980	10.6
Potash products	3,153	1,480	-1,673	-53.1
Sodium nitrate	87,699	79,723	-7,976	-9.1
Urea	41,785	49,527	7,742	18.5
Other chemical nitrogen products	1,769	1,019	-750	-42.4
Total nitrogen	1,136,669	1,291,661	154,992	13.6
MATERIALS SUPPLYING AVAILABLE P_2O_5		Available P_2O_5		
Ammonium phosphate: 11-48	23,265	30,997	7,732	33.2
" " 13-39	16,568	17,850	1,282	7.7
Ammonium phosphate sulfate: 16-20	52,295	53,383	1,088	2.1
Ammonium phosphate nitrate: 27-14	844	1,595	751	89.0
Basic slag	14,115	13,350	-765	-5.4
Bonemeal: raw and steamed	3,244	2,884	-360	-11.1
Calcium metaphosphate	26,786	28,218	1,432	5.3
Diammonium phosphate: 21-53	7,523	10,667	3,144	41.8
Natural organics	9,740	10,799	1,059	10.9
Phosphate rock and colloidal phosphate	27,757	24,919	-2,838	-10.2
Phosphoric acid	7,515	9,400	1,885	25.1
Potash products	73	75	2	2.7
Superphosphate: 22% and under	122,500	112,096	-10,404	-8.5
" over 22%	147,622	169,456	21,834	14.8
Other phosphates	2,500	1,677	-823	-32.9
Total available P_2O_5	462,347	487,366	25,019	5.4
MATERIALS SUPPLYING K_2O		K_2O		
Cotton hull ashes	368	219	-149	-40.5
Lime-potash mixtures	1,418	1,939	521	36.7
Manure salts	246	346	100	40.6
Natural organics	5,758	8,699	2,941	51.1
Potassium chloride	194,754	227,400	32,646	16.8
" magnesium sulfate	1,480	1,704	224	15.1
" sodium nitrate	2,518	1,404	-1,114	44.2
" sulfate	12,926	13,546	1,620	4.8
Tobacco stems	80	235	155	193.8
Wood ashes	129	108	-21	-16.3
Other potash products	89	202	113	127.0
Total K_2O	219,766	255,802	36,036	16.4

1/ Revised by adding 739 tons to Wyoming total.

Table 13. Change in consumption of primary nutrients year ended June 30, 1957, compared with previous year

Tons

State and region	Mixtures: N	Mixtures: P_2O_5 Available	Mixtures: P_2O_5 Total	Mixtures: K_2O	Mixtures: Total (N, avail. P_2O_5, and K_2O)	Materials: N	Materials: P_2O_5 Available	Materials: P_2O_5 Total	Materials: K_2O	Materials: Total (N, avail. P_2O_5, and K_2O)
Maine	-1,283	-1,275	-1,636	-1,408	-3,966	891	72	76	61	1,024
New Hampshire	219	425	358	482	1,126	203	-106	-108	12	109
Vermont	323	859	884	923	2,105	168	-321	-341	0	-153
Massachusetts	869	1,160	1,206	1,611	3,640	177	187	237	75	439
Rhode Island	148	228	275	203	579	14	-2	13	10	22
Connecticut	675	1,376	1,417	851	2,902	78	-529	-517	-104	-555
New England	951	2,773	2,504	2,662	6,386	1,531	-699	-640	54	886
New York	1,838	3,158	3,197	1,883	6,879	680	500	444	305	1,485
New Jersey	39	488	462	147	674	310	8	-77	-2	316
Pennsylvania	3	-1,060	-1,126	497	-560	392	23	-306	477	892
Delaware	167	302	342	421	890	-143	31	40	-46	-158
District of Columbia	-19	11	10	-3	-11	-17	-6	-5	3	-20
Maryland	331	1,290	1,177	1,423	3,044	195	132	138	98	425
West Virginia	95	-419	-528	-6	-330	8	86	58	30	124
Middle Atlantic	2,454	3,770	3,534	4,362	10,586	1,425	774	292	865	3,064
Virginia	980	-609	-658	866	1,237	963	300	143	4	1,267
North Carolina	-3,138	-10,821	-11,854	-2,147	-16,106	7,375	-118	-843	9	7,266
South Carolina	609	-5,963	-6,361	-4,239	-9,593	1,728	594	551	-649	1,673
Georgia	8,375	6,142	5,290	8,692	23,209	2,035	-5,105	-5,328	-565	-3,635
Florida	8,254	9,059	10,858	11,911	29,224	4,994	-18	1,064	-5	4,971
South Atlantic	15,080	-2,192	-2,725	15,083	27,971	17,095	-4,347	-4,413	-1,206	11,542
Ohio	3,684	2,124	787	-3,242	2,566	3,197	2,373	2,058	1,786	7,356
Indiana	-126	516	674	-5,418	-5,028	7,250	1,942	3,366	13,753	22,945
Illinois	3,311	1,984	1,958	-3,365	1,930	4,195	5,720	-9,334	11,868	21,783
Michigan	4,059	2,068	2,076	-2,617	3,510	2,841	690	926	1,019	4,550
Wisconsin	1,099	1,533	1,233	3,819	6,451	538	994	740	1,432	2,964
East North Central	12,027	8,225	6,728	-10,823	9,429	18,021	11,719	-2,244	29,858	59,598
Minnesota	3,540	8,843	9,059	3,673	16,056	2,379	4,956	5,204	3,034	10,369
Iowa	467	-535	-662	1,504	1,436	6,100	201	323	251	6,552
Missouri	1,328	-742	-1,276	1,517	2,103	10,475	287	-10,030	1,709	12,471
North Dakota	1,326	1,575	1,490	178	3,079	1,031	1,347	1,105	2	2,380
South Dakota	89	55	60	-13	131	-1,060	28	10	-15	-1,047
Nebraska	381	1,235	1,253	283	1,899	13,563	4,126	4,215	81	17,770
Kansas	821	2,422	2,074	95	3,338	3,225	-2,540	-2,400	-148	537
West North Central	7,952	12,853	11,998	7,237	28,042	35,713	8,405	-1,573	4,914	49,032
Kentucky	1,244	1,086	1,137	2,744	5,074	1,898	-924	-1,722	-436	538
Tennessee	2,402	2,239	2,365	2,786	7,427	529	1,174	862	364	2,067
Alabama	-3,798	-2,829	-3,312	5,132	-1,495	-445	489	428	39	83
Mississippi	-1,050	-2,349	-2,591	-1,503	-4,902	9,233	1,340	1,106	284	10,857
East South Central	-1,202	-1,853	-2,401	9,159	6,104	11,215	2,079	674	251	13,545
Arkansas	-1,729	-2,496	-2,750	-3,736	-7,961	-1,308	-417	-519	-1,696	-3,421
Louisiana	-206	1,124	1,057	-56	862	1,575	-1,863	-2,673	-199	-487
Oklahoma	-718	-1,809	-1,917	-800	-3,327	-78	-2,273	-2,756	-298	-2,649
Texas	239	3,305	3,232	354	3,898	21,448	2,207	1,964	449	24,104
West South Central	-2,414	124	-378	-4,238	-6,528	21,637	-2,346	-3,984	-1,744	17,547
Montana	60	8	0	8	76	2,326	2,864	3,116	-4	5,186
Idaho	647	641	709	71	1,359	2,664	1,629	1,520	54	4,347
Wyoming	-38	-184	-192	-2	-224	359	-367	-361	3	-5
Colorado	-38	-193	-199	54	-177	2,196	1,373	1,383	17	3,586
New Mexico	-80	-81	-82	8	-153	2,074	1,430	1,478	63	3,567
Arizona	991	1,246	1,297	289	2,526	4,806	597	546	-16	5,387
Utah	56	133	118	21	210	-879	662	698	17	-200
Nevada	31	26	28	22	79	237	4	4	0	241
Mountain	1,629	1,596	1,679	471	3,696	13,783	8,192	8,384	134	22,109
Washington	257	-566	-545	-749	-1,058	5,686	-1,350	-1,371	129	4,465
Oregon	248	625	530	58	931	10,824	1,420	1,473	-678	11,566
California	4,292	2,863	2,787	550	7,705	10,598	-416	-720	2,895	13,077
Pacific	4,797	2,922	2,772	-141	7,578	27,108	-346	-618	2,346	29,108
Continental U. S.	41,274	28,218	23,711	23,772	93,264	147,528	23,431	-4,122	35,472	206,431
Hawaii	-67	598	799	115	646	6,308	1,561	1,995	562	8,431
Puerto Rico	5,746	2,736	3,113	3,622	12,104	1,156	27	27	2	1,185
Territories	5,679	3,334	3,912	3,737	12,750	7,464	1,588	2,022	564	9,616
Total	46,953	31,552	27,623	27,509	106,014	154,992	25,019	-2,100	36,036	216,047

FARM CHEMICALS
Business & Management

STAUFFER EXPANDS RESEARCH IN PROCESS DEVELOPMENT

Stauffer Chemical Co. has completed plans to build a process development laboratory at its Research Center in Richmond, Calif. The unit, which will cost more than $100,000, is expected to be ready for occupancy by the end of September.

Part of Stauffer's long-range program to expand research activities, the laboratory will include pilot plant and kindred facilities to permit evaluation of both organic and inorganic processes. The development work now being carried on at Torrance, Calif. will be moved to the Richmond Center when the new unit is completed.

SOIL TREATMENT MOVIE AVAILABLE

A new sound-and-color 16 mm. film which portrays how soil fumigation increases crop yields has been produced by Stauffer Chemical Co. Prints are available on loan and without charge to interested agricultural groups.

The film depicts, in actual field scenes, modern methods of applying liquid soil fumigants such as Vapam. It also includes a series of problem-and-solution sequences which show how soil fumigation has been used to control pink-root, fusarium wilt, oak-root fungus, nematodes and weeds and soil pests.

Prints of the 12 minute film may be obtained by writing to Stauffer, 380 Madison Ave., New York City 17.

FARMER COOPERATIVES GAIN MEMBERSHIPS FERT. PURCHASES RANK 3rd

Memberships as well as average number of memberships in marketing, farm supply and related service cooperatives have shown marked growth in the past three decades according to Farmer Cooperative Service, USDA.

In fiscal 1926, the number of memberships was 2.7 million. In fiscal 1956—the latest year for which complete figures are available—number of memberships exceeded 7.7 million, or almost three times as many. Many farmers are members of more than one cooperative.

Average membership for each cooperative was 250 in fiscal year 1926. By fiscal year 1956 it was 783, or more than 3 times as many.

The table below shows that fertilizer ranks third in dollar volume of supplies purchased for patrons.

SUPPLIES PURCHASED FOR PATRONS, 1955-56[1]

	No. of Coops. Handling	Gross Business $1,000	Net Business After Adusting for Duplication[2] $1,000
Feed	4,402	1,017,672	773,955
Petroleum products	2,739	783,810	493,605
Fertilizer	**4,011**	**418,574**	**261,255**
Seed	3,686	133,415	97,228
Building materials	1,467	111,612	78,773
Farm machinery and equipment	1,851	97,938	68,497
Meats and groceries	973	54,194	46,757
Sprays and dusts	**2,145**	**50,090**	**35,573**
Containers	1,120	52,808	25,235
Other supplies	4,479	250,767	163,394
Total farm supplies	**[3]7,330**	**2,970,880**	**2,044,272**

[1]Preliminary
[2]Does not include business between cooperatives
[3]Adjusted for duplication arising from multiple activities performed by many cooperatives.

OLIN MATHIESON OPERATING UNITS CONSOLIDATED

Completion of an integration program which consolidates its operating units into seven industrial divisions has been announced by Olin Mathieson Chemical Corp.

Eleven former divisions have been integrated into four new divisions while the Squibb, Winchester-Western and International divisions continued their present organization structure.

The four new divisions and the vice presidents appointed to head them are Chemicals — Edward Block; Metals—Jess E. Williams, Packaging — Robert H. Evans; and Energy—Carroll Copps.


Block

As head of the Chemicals Div., Block will be in charge of agricultural, organic, industrial and phosphate chemicals operations, formerly independent divisions. He has been vice president in charge of Olin Mathieson's Agricultural and Phosphate Chemicals Divisions.

ATLAS POWDER DEDICATES $3 MILLION TECHNICAL UNIT

Basic research and chemical product development activities of Atlas Powder Co. will be housed in a $3 million technical center at the company headquarters in suburban Wilmington.

CYANAMID REDUCES PRICES OF AEROSOL AGENTS

American Cyanamid Co. has announced price reductions on all grades of Aerosol surface active agents.

New price for Aerosol OT-75 per cent is 45 cents a pound in minimum quantities and 35 cents a pound in tank wagon quantities. Reductions in other grades range from 40 to 2 cents a pound.

The company indicated that the lower prices coincide with its plans for expanding production of surface active agents at its Bridgeville, Pa. plant.

NEW ROAD TO LINK MONSANTO PLANT & PHOSPHATE MINE

Work is scheduled to begin in the near future on a new private road between Monsanto Chemical Co.'s elemental phosphorus plant at Soda Springs, Ida. and its phosphate mine 11.2 miles away.

The new road to be constructed by Morrison-Knudsen Co., which operates the mine for Monsanto, will enable use of specially constructed carrier units capable of hauling 75 tons of ore each trip. This is three times the haul load possible with present transportation operations, a Monsanto official said.

Designed by Mack Truck Co. for Morrison-Knudsen, the new carrier units will consist of a tractor unit, a two-axle trailer and a four-axle trailer. Each unit, 75 feet long, will have a gross weight of about 100 tons. The units are believed to be the largest highway haulers in the United States.

SOVIET JOURNAL NOW AVAILABLE IN ENGLISH

A complete English translation of the leading Soviet automatic control journal *Avtomatika I Telemekhanika* is now available, reports the Instrument Society of America which is handling subscriptions and circulation of the English translations.

The new translation and low subscription cost have been made possible, ISA reports, by a grant-in-aid to the Massachusetts Institute of Technology from the National Science Foundation.

Subscription rates are available from the Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa.

V-C CHEMICALS REPORTS NINE MONTHS' INCOME

Net income of Virginia-Carolina Chemical Corp. for the nine-month period ended March 31, 1958 totaled $311,694, as compared with $361,690 for the same period last year.

In a letter to stockholders, Richard E. McConnell, secretary, said that net income was primarily affected by reduced sales in the Fertilizer Div. He pointed out that prolonged and unusually severe winter weather delayed the planting season.

Sales for the period ending March 31, 1958 totaled $38,247,642, while sales in the comparable 1956–1957 period reached $44,298,800.

VICTORVILLE CO. LICENSED TO MAKE, SELL CCC DILUENT

Calcium Carbonate Co. reports that exclusive license has been granted the Victorville Lime Rock Co., Victorville, Calif., for the manufacture and sale of "CCC" diluent in the far western states.

Victorville Lime Rock Co. is a wholly-owned subsidiary of the C. K. Williams Co., East St. Louis, Ill.

IMPORTANT PESTS OF 1957 LISTED

The corn earworm (also known as the bollworm or tomato fruitworm), the housefly and the mosquito were named more often than any other insects in state reports of some of the more important pests of 1957, USDA says.

Plant mites (especially spider mites), the European corn borer, aphids and grasshoppers were also frequently mentioned as crop pests, and termites and cockroaches as nuisances to man. Among pests of livestock, the horn fly, cattle grubs, ticks and cattle lice were most often named.

HOLLAND DEDICATES ITS 1st SODA ASH PLANT

Early in June, Dutch government officials and industrialists witnessed the official dedication by Queen Juliana of Holland's first soda ash plant. The plant is located at Delfzijl on the Eems estuary near the country's northern coast.

Raymond F. Evans, chairman and president of Diamond Alkali Co., participated in the dedication. In cooperation with Zola G. Deutsch, consulting engineer of New York, Diamond Alkali engineers since 1954 have worked with Nederlandse Soda Industrie of Holland in the design and construction of the new facility.

While the plant was being built, a number of Dutch engineers were located at Diamond's facilities in Painesville, O., for training with the assistance of Diamond engineers in processing techniques, plant operating procedures and equipment maintenance routines.

DIAMOND MEXICAN AFFILIATE ADDS TO PLANT FACILITIES

Additional plant facilities at Hermosillo, Sonora, Mexico have been completed by Insecticidas Diamond del Pacifico, S. A. de C. V., according to Francisco Schwarzbeck, general manager of the Diamond Alkali Co. affiliate. The company already operates a plant in Ciudad Obregon, Sonora.

Sales of pesticides produced at the new plant will be handled by Agro Quimica del Pacifico, S.A., Diamond distributor for the Hermosillo area.

HOOKER ELECTROCHEMICAL BECOMES HOOKER CHEMICAL

Hooker Chemical Corp. is the new name adopted by Hooker Electrochemical Co.

Hooker and Shea Chemical stockholders voted overwhelmingly in separate meetings May 28 to consolidate Shea Chemical with and into Hooker.

AP&C ADDS TO BOARD

The board of directors of American Potash & Chemical Corp. has been increased from nine to ten. Charles R. Lindsay III, president of the Lindsay Chemical Div., has been elected a director and vice president of the company.

Lindsay Chemical Co. was merged into AP&C on May 1.

N DIV. REPORTS PRICES

Nitrogen Div., Allied Chemical Corp., has announced prices of Arcadian nitrogen solutions and anhydrous ammonia for fertilizer manufacturing use in effect from Jan. 1 to June 30 will be continued through December 31, 1958.

Delivered cost will be equalized against competitive producing points, the announcement added.

JACOB WHITE BECOMES NITROGEN DIV. PRESIDENT

Appointment of Jacob White as president of Nitrogen Div. has been announced by Allied Chemical Corp. President Glen B. Miller. White joined Allied Chemical in 1921. He was named assistant to the president of Nitrogen Div. in 1952, and in 1953 became vice president of the division, the position he held until his recent appointment.

White

William H. Winfield, former division vice president has been named International Div. president. Wesley Wickersham, vice president of the division, will be in charge of export operations.

FMC CREATES CHEMICALS AND PLASTICS DIVISION

New name for Food Machinery and Chemical Corp.'s Organic Chemicals Div. is the Chemicals & Plastics Div. The company reported that the name change reflects the increasing concentration of the division on resin and plastic work.

The division manufactures Dapon resin, allyl and methallyl monomers and a broad range of Ohio-Apex plasticizers, as well as organic chemicals derived from phosgene and acetoacetic ester reactions.

SWIFT & CO. NAMES NEW PLANT FOOD MANAGERS

New agricultural plant food marketing manager of Swift & Co.'s Agricultural Chemical Div. is Wayne P. Dean. He succeeds W. J. Chapin, recently appointed head of the General Feed Department.

Dean

Dean is replaced as manager of the Columbia, S. C. plant food factory by E. H. Rappe, former manager of the Atlanta plant. R. H. Woodward of the Chicago general office staff becomes manager of the Atlanta, Georgia, Div.

Alf H. Oines, also of the Chicago staff, assumes management of the Baltimore, Md., Div. succeeding A. W. Langdon, who has been transferred to Calumet City, Ill.

NITROPHOSPHATE PLANT TO BE BUILT IN HOLLAND

Albatros Superphosphate Factories of Vlaardingen, Holland, have awarded an engineering contract to The D. M. Weatherly Co. of Atlanta, Ga., for a nitrophosphate plant.

The plant will be the first to utilize the TVA continuous rotary ammoniator for the production of nitrophosphate, according to Weatherly Co.

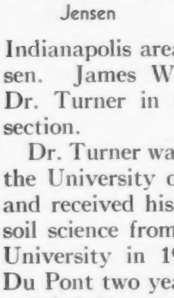
FARM CHEMICALS People

American Agricultural Chemical Co. C. F. Lane has been named acid superintendent of the Southern Div. He will be responsible for acid production at the following AAC plants: Charleston, S. C.; Columbia, S. C.; Greensboro, N. C.; Montgomery, Ala.; Pensacola, Fla.; Pierce, Fla. and Savannah, Ga.

Campbell Fertilizer Co., Inc., has announced appointment of John M. Davis as general manager.

Diamond Alkali Co. Anthony DePhillips becomes assistant manager of the Philadelphia branch sales office, succeeding the late George J. Soren. DePhillips has been with Diamond for nearly 30 years.

Du Pont Co. Ove F. Jensen, sales specialist on Uramon ammonia liquors, will retire on July 31 after a 25-year career with Du Pont Co. Dr. Philip B. Turner has been transferred to the Indianapolis area to succeed Jensen. James W. Lewis replaces Dr. Turner in the northeastern section.



Jensen

Dr. Turner was graduated from the University of Maine in 1948 and received his Ph.D. degree in soil science from Michigan State University in 1954. He joined Du Pont two years later and was appointed a specialist on UAL in January, 1957.

Lewis, a sales technologist, joined Du Pont after graduating from the University of Kentucky in 1948.

Escambia Chemical Corp. Joseph J. Laputka was appointed treasurer of the firm at a recent meeting of the board of directors. Laputka joined Escambia last year as assistant treasurer.

Ferro Corp. Election of J. Robert Killpack as comptroller has been announced by Ferro's board of directors. He fills the vacancy created on April 29 by the death of Joseph C. Wessel.

Food Machinery and Chemical Corp. The Chemical Divisions have named Dr. Hans O. Kauffmann director of research and development for the Inorganic Chemicals Dept. and Dr. Oscar H. Johnson director of research and development for the Organic Chemicals Dept.

Formerly technical director of Becco Chemical Div., Dr. Kauffmann now will be responsible for research and development activities of the Westvaco Chlor-Alkali Div. and Westvaco Mineral Products Div., as well as those of the Becco Chemical Div.

Prior to his new appointment, Dr. Johnson was director of research for Niagara Chemical Div. He will direct the basic organic research programs for the newly formed Organic Chemicals Dept., comprising Niagara and the Chemicals & Plastics Div., at the FMC Central Research Lab.

Hayes-Sammons Chemical Co. Odell Godwin has joined the company as credit manager, according to an announcement by Thomas B. Sammons, Jr., president. Godwin formerly was manager of a citrus nursery company in the Rio Grande Valley of Texas.

Godwin

International Minerals & Chemical Corp. The board of directors has elected Thomas M. Ware president, succeeding his father, Louis Ware, who was elected chairman of the board and chief executive officer.

T. M. Ware

Louis Ware

At 39, the former administrative vice president becomes the fifth and youngest president of the 50-year-old corporation.

Maurice H. Lockwood, vice president of the Plant Food Div., resigned on June 1. Before going to International as Plant Food Div. vice president in 1948, Lockwood had served two years as the first full-time president of the National Fertilizer Association. A native of New Britain, Conn., he was with Eastern Farmers Exchange from 1924 to 1946.

Lockwood was given the Connecticut Alumni Recognition Award during the 70th annual Alumni Day at the University of Connecticut.

Lockwood

Zigler

John D. Zigler, who has had 25 years of service with International, will head the Plant Food Div. as general manager, a position he has held since 1946.

George J. Urbanis has been named district sales manager of

International's Phosphate Chemicals Div., in charge of a territory extending into New England, the Mid-Atlantic states, Ohio and Canada. Urbanis was in sales work with the J. B. Ford Div. of Wyandotte Chemicals Corp. before joining International in November, 1955, as sales representative in the Pittsburgh area.

Urbanis

Wilson & Geo. Meyer & Co. Philip A. Sawyer, assistant manager of agricultural sales, Southwest territory, has been transferred to Salt Lake City, Utah, where he will be assistant sales manager of Wilson & Geo. Meyer & Co. Intermountain, a Meyer affiliate.

Michigan Chemical Corp. appointments: Kenneth E. Walker to the position of director, Div. of Planning and Cost Control; and David M. Coleman to its chemical sales staff.

Monsanto Chemical Co. Arthur P. Kroeger, former associate director of marketing for the company's Organic Chemicals Div. on June 1 was named marketing director for the division. He succeeds John L. Hammer, Jr. who left Monsanto to become assistant to the president of Mississippi Lime Co.

Nopco Chemical Co. Charles Lighthipe has been named to the post of technical director, Industrial Laboratories, and Dr. Ramsey Christian to the position of director, Industrial Development Laboratories.

Olin Mathieson Chemical Corp. The National Committee on Boys and Girls Club Work has elected to its board of directors S. L. Nevins, Little Rock, Ark., vice president of Olin Mathieson's Plant Food Div. Nevins is one of 12 directors who manage the affairs of the committee, a nonprofit organization cooperating with state and federal extension services in furthering 4-H club work.

Pittsburgh Coke & Chemical Co. Dr. Salvatore Piccione has joined the Research and Development Dept., assigned to the Analytical and Physical Research Section.

Quebec Fertilizers Inc. P. E. Bastien, Quebec district sales manager of the Fertilizer and Feeds Div., Canada Packers Ltd., was elected chairman of Quebec Fertilizers at the organization's annual meeting at Le Gîte, Quebec, June 10. Other officers elected included vice president—George R. Blais, Canadian Industries Ltd.; executive director—Ronald Olivier, William Houde Ltd.; and secretary-treasurer—L. E. Whitworth, International Fertilizers Ltd.

Sohio Chemical Co. New agricultural sales representative for northern Illinois, Iowa, Wisconsin and Minnesota is William L. Young. Sohio had been represented in this area by Russell I. Pisle, Jr., who is moving to Ohio to represent the company in that area.

Young

Pisle

Young has been with Sohio for eight years. For the past three years he worked in the distribution section. Pisle has been calling on agricultural products customers for Sohio since March of 1955.

Union Carbide Chemicals Co., Div. of Union Carbide Corp. John W. Keays becomes a member of the Crag Agricultural Chemicals Dept.'s Product Development Group. He will assist in the market development of Sevin insecticide. He was formerly located at Boyce Thompson Institute for Plant Research, where he assisted in laboratory and field evaluations of Sevin.

Keays

FARM CHEMICALS

— Associations & Meetings —

NPFI HONORS STUDENT

Larry L. Casey (center) agriculture student at the University of Illinois who is 1958 winner of the National Plant Food Institutes "Best Agronomy Junior Award" including a cash prize of $200. The award was presented by Dr. W. A. Burger (left) of the Agronomy Dept. at Illinois, and Zenas H. Beers, Midwest regional director of the NPFI.

INSTRUMENT-AUTOMATION CONFERENCE & EXHIBIT

"Instrumentation in the Space Age" is the theme for the 13th annual Instrument-Automation Conference and Exhibit to be held in Philadelphia Convention Hall, Sept. 15 and 19.

Workshops have been planned covering computers, control systems, data handling, education, and sales engineering. A maintenance clinic and technical session on analyzing, controlling, data processing, measuring and telemetering also are on the agenda.

More than 400 manufacturers are expected to have exhibits at the meeting.

CMRA ELECTS OFFICERS

Named president-elect of the Chemical Market Research Association at its May meeting was James E. Sayre, of Barret Div., Allied Chemical Corp. Next year, Sayre will automatically become president.

Walter C. Gwinner, Esso Standard Oil Co., was elected secretary and E. William Eipper of Stauffer Chemical Co. became treasurer.

F. Scott Godron of Victor Chemical Works and Harry F. Pfann of Pittsburgh Coke & Chemical Co. were elected directors of the organization.

OFFICERS ELECTED BY MFG. CHEMISTS' ASSN.

Harry B. McClure, vice president of Union Carbide Corp., was elected chairman of the board of directors of the Manufacturing Chemists' Association at its 86th annual meeting June 12–14 at the Greenbrier, White Sulphur Springs, W. Va. He succeeds Ernest Hart, president of Food Machinery and Chemical Corp.

John T. Conner, Merck & Co. president, succeeds McClure as chairman of the executive committee.

Re-elected were Gen. John E. Hull, USA (Ret.), full-time president and a director; M. F. Crass, Jr., full-time secretary-treasurer; and D. S. Frederick, vice president of Rohm & Haas Co., as MCA vice president. Fred C. Foy, president of Koppers Co., Inc., was elected an MCA vice president.

K-STATE HOST TO 3rd WORK CONFERENCE ON SYSTEMICS

Progress in research and development of Trolene, Co-Ral and related insecticides was considered by representatives from industry, state and federal organizations at a meeting at Kansas State College, Manhattan, May 26–27.

Problems of occasional toxic symptoms following the use of systemic insecticides, the best time of treatment and most effective methods of treatment were discussed.

Researchers from Florida to Oregon, and from Canada, Germany and the Belgian Congo, reported their experimental results.

The conference was sponsored by the entomological research division of USDA and the medical and veterinary section of the Entomological Society of America, with the K-State entomology department as host. About 150 persons attended the meetings.

Shown at the Kansas State Conference are (from left) Herbert Knutson, head of K-State's Entomology Dept.; Justus Ward, of the Insecticide Registration Section, USDA; J. W. Cunkelman, chairman, National Cattle Grub Committee of Livestock Conservation, Inc.; and E. F. Knipling, director, Entomological Research, U. S. Department of Agriculture.

SAFETY AWARDS TO ROYCE U.S. RUBBER & TENN. CORP.

U. S. Rubber Co., Royce Chemical Co. and Tennessee Corp. have received Lammot duPont Safety Awards from the Manufacturing Chemists' Association. The awards are presented annually by MCA to "those chemical firms showing the greatest improvement in plant safety over a five-year period."

The winner among companies whose employees worked more than two million man-hours a year is U. S. Rubber's Naugatuck Div., with a decrease of 59 per cent in its accident frequency rate. Runner-up is American Potash & Chemical Corp.

Royce Chemical Co. and the Tennessee Corp. tied for first place in the category for firms with an exposure of two million man-hours or less. Each reported a 100 per cent decrease in its accident frequency rate.

NPFI PROVIDES GRANTS FOR FERTILIZER RESEARCH

Grants have been provided to three additional states for research and demonstrations by the National Plant Food Institute. (Grants to ten states were reported in the June FARM CHEMICALS, page 55.)

Michigan State University soils scientists and agricultural economists are cooperating on a fertilizer research project for which NPFI provided a $2,500 grant. Overall objective of the project is to measure crop response to fertilizer use and then evaluate the response in economic terms.

In **Missouri,** grants totaling $1,420 have been provided to help support pasture fertilization demonstrations. The 1958 demonstrations will include maintenance fertilizer applications on previously renovated pastures which had received treatments respectively in the spring and fall of 1957.

A $2,000 grant has been presented to the **Minnesota** Agricultural Extension Service for pasture fertilization demonstrations this year in the southeastern and northern parts of the state. Agricultural Extension agents and farmers in 11 Minnesota counties are cooperating in the 1958 program.

CALENDAR

July 8-10. Pacific N. W. Fertilizer Conference, Pocatello, Idaho.
July 13-15. Plant Food Institute of Va. and N. C. meeting, Cavalier Hotel, Raleigh, N. C.
July 13-16. Northeast Branch, American Society of Agronomy, Cornell University, Ithaca, N. Y.
July 17-18. Southwest Fertilizer Conf. and Grade Hearing, Buccaneer Hotel, Galveston, Tex.
July 24. Agronomy Field Day of West Virginia University, Ohio Valley Exp. Station, Point Pleasant, W. Va.
July 29-30. Fertilizer Conference sponsored by Ala. Polytechnic Institute Experiment Station: July 29—Black Belt Substation near Marion Junction, Ala.; July 30—Prattville Experiment Field.
July 30. Annual Kentucky Fertilizer Conference, Greenville, Ky.
Aug. 4. National Joint Committee on Fert. Application meeting, held in conjunction with American Society of Agronomy, Purdue University, Lafayette, Ind.
Aug. 20-24. Canada Fertilizer Association annual meeting, Manoir Richelieu, Murray Bay, Que.
Sept. 7-12. American Chemical Society national meeting, Chicago.
Sept. 9-12. National Chemical Exposition, sponsored by Chicago Section, American Chemical Society, International Amphitheatre, Chicago.
Sept. 15-19. Instrument-Automation Conference and Exhibit, Philadelphia, Pa.
Oct. 14-15. Western Agricultural Chemicals Assn. annual meeting, Villa Hotel, San Mateo, Calif.
Oct. 20. Sales clinic of Salesmen's Association of the American Chemical Industry, Roosevelt Hotel, New York City.
Oct. 20-21. Fertilizer Section, National Safety Council annual fall meeting, LaSalle Hotel, Chicago.
Oct. 22-24. Pacific N. W. Plant Food Assn. annual meeting, Gearhart, Ore.
Oct. 28. Assn. of Consulting Chemists & Chemical Engineers annual meeting, Biltmore Hotel, New York City.
Oct. 28-29. Northwest Garden Supply Trade Show, Masonic Temple, Portland, Ore.
Oct. 29-31. 25th annual meeting, National Agricultural Chemicals Assn., Bon Air Hotel, Augusta, Ga.
Nov. 4-6. Canadian National Packaging Exposition sponsored by Packaging Assn. of Canada, Automotive Bldg., Exhibition Grounds, Toronto, Ont.
Nov. 9-11. Calif. Fertilizer Association 35th annual convention, Ambassador Hotel, Los Angeles.
Nov. 24-25. Eastern Branch, Entomological Society of America annual meeting, Lord Baltimore Hotel, Baltimore, Md.
Dec. 1-4. Annual meeting of Entomological Society of America, Hotel Utah, Salt Lake City.
Dec. 3-5. Agricultural Ammonia Institute annual meeting, Morrison Hotel, Chicago.
Dec. 9-11. Annual meeting of Chemical Specialties Mfrs. Assn., Commodore Hotel, New York City.
Dec. 17-18. Beltwide Cotton Production Conf., sponsored by National Cotton Council, Rice Hotel, Houston, Tex.

INSURANCE COMMITTEE IS FORMED BY MCA

Formation of an Insurance Committee has been announced by the Manufacturing Chemists' Association.

The committee "will provide a medium for the analysis and exchange of information on underwriting, claims, loss control and other insurance matters for the benefit of the association's member companies."

Chairman of the committee is O. M. Langenberg of Mallinckrodt Chemical Works, St. Louis. N. H. Munson of The Dow Chemical Co., Midland, Mich., is vice chairman. Staff secretary to the committee is F. G. Stephenson.

CFA ANNOUNCES ESSAY CONTEST WINNERS

Wayne Ahlers, a vocational agriculture student at Yuba College, Marysville, Calif., has been named winner of the Grand Award in the 1958 California Fertilizer Essay Contest, the California Fertilizer Association has announced.

Sponsored by the association's Soil Improvement Committee, the contest is open only to the two-year students in California's junior colleges.

Title of the 1958 essays was "Use of Fertilizers on Pastures and Rangeland." Ahlers received a check for $100 for his essay, and was given the perpetual trophy for the coming year. A check for $25 will be sent to the author of the best essay in each other competing school.

AGR. POTASH DELIVERIES DOWN 6% IN JAN.—MARCH

Deliveries of potash for agricultural purposes in this country, Canada, Cuba, Puerto Rico and Hawaii by eight American producers totaled 929,326 tons of salts (544,204 tons K_2O equiv.), according to the American Potash Institute. Compared with the same period in 1957, this was a decrease of 6 per cent in salts and K_2O.

Non-agricultural deliveries for the quarter amounted to 27,830 tons K_2O, 8 per cent under last year.

FERTILIZER SALES IN KENTUCKY

During the first four months of 1958, 197,453 tons of mixed fertilizer and 41,254 tons of straight materials were sold in Kentucky, according to a report from the Department of Feed and Fertilizer, Kentucky Agricultural Experiment Station.

In the same 1957 period, 225,433 tons of mixed goods and 53,531 tons of straight goods were sold.

Leading in tonnage sales was 5–10–15 (53,470 tons), followed by 4–12–8 (32,956 tons).

LIME SALES FOR MARCH HIGHER THAN FEBRUARY

Domestic sales of open-market lime in March, 600,216 short tons increased over the previous months output of 547,047 tons, according to reports by producers to the Bureau of Mines, U. S. Dept. of the Interior.

Lime sold for agricultural use totaled 7,199 tons, while that sold for chemical and other industrial use totaled 368,997 tons.

MARCH SUPER SHIPMENTS UP 29% FROM FEBRUARY

Shipments of superphosphate and other phosphatic fertilizers during March totaled 216,857 short tons, a 29 per cent increase from the volume shipped during the previous month.

Stocks held by producing plants as of March 31, 1958 totaled 358,883 short tons, or 13 per cent less than those held on Feb. 28.

SUPERPHOSPHATE IN 1957

compiled from government reports

	Production		Shipments		Used in Reporting Plants	
	1957	1956	1957	1956	1957	1956
Normal and Enriched	1,380,009	1,481,248	763,544	801,808	668,989	739,209
Concentrated	831,510	753,417	819,971	720,178	23,289	46,963
Ammonium Phosphate	171,351	—	166,854	—	7,276	—
Wet-Base Goods & Other Phos. Ferts.	72,227	204,101	69,459	181,476	4,401	13,161
Total	2,455,097	2,438,766	1,819,828	1,703,462	703,955	799,333

Production—March, 1958

Compiled from Government Sourses

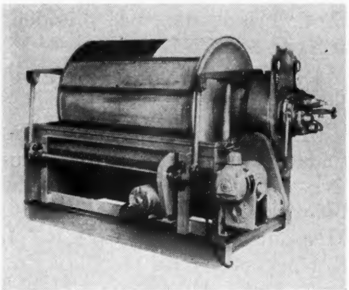
Chemical	Unit	March 1958	March 1957	February 1958
Ammonia, synth. (anhydrous)	s. tons	339,015	320,733	286,734
Ammonia, byproduct liquor (NH_3 content)	s. tons	1,241	1,044	1,103
Ammoniating solutions (incl. urea ammoniation sol.) 100% N	s. tons	64,364	——	50,746
Ammonium nitrate, fert. grade (100% NH_4NO_3)	s. tons	217,501	201,173	181,686
Ammonium sulfate				
synthetic (technical)	s. tons	101,116	97,834	80,777
byproduct	s. tons	53,001	80,748	48,375
BHC (Hexachlorocyclohexane)	pounds	[4]1,711,960	4,379,199	——
Gamma content	pounds	366,433	693,343	——
Calcium arsenate (commercial)	s. tons	——	——	——
Copper sulfate (gross)	s. tons	3,472	6,424	4,176
DDT	pounds	11,880,845	11,522,140	10,792,520
2,4-D acid	pounds	3,599,178	2,555,211	3,114,667
esters and salts	pounds	3,427,073	2,581,329	2,039,825
esters and salts (acid equiv.)	pounds	2,648,139	2,138,802	1,613,436
Phosphoric acid (100% P_2O_5)[1]	s. tons	155,192	137,995	135,140
Sulfur, native (Frasch)	l. tons	429,475	471,548	415,186
recovered[2]	l. tons	51,104	39,800	49,174
Sulfuric acid, gross (100% H_2SO_4)	s. tons	[3]1,363,696	1,417,538	1,214,072
Superphosphate and other phos. materials (100% APA)	s. tons	230,127	231,218	*210,399
normal and enriched (100% APA)	s. tons	123,200	137,962	*116,949
concentrated (100% APA)	s. tons	78,624	70,173	70,835
ammonium phosphates (100% APA)	s. tons	16,239	15,551	11,495
other phos. ferts. (incl. wet-base goods) (100% APA)	s. tons	12,064	7,532	11,120
2,4,5-T acid	pounds	——	——	——
Urea (total primary production)	pounds	82,306,035	——	80,120,934

*Revised. [1]Published on 50% H_3PO_4 basis prior to January 1958. The factor used to convert to 100% P_2O_5 basis is 0.3622 [2]Recovered sulfur of a purity of 97 per cent or greater. [3]Includes quantities for one plant previously not reporting. [4]Including Lindane.

FARM CHEMICALS

Equipment & Supplies

DORR-OLIVER DEVELOPS FIBERGLAS FILTER



Dorr-Oliver Inc. has announced the availability of a rotary drum vacuum filter constructed of Fiberglas. Said to be the first plastic filter to be offered commercially, the unit has been developed for mildly corrosive applications which normally require special materials of construction.

Generally, components of the filter are fabricated of molded plastic with certain supporting structural members constructed of resin coated mild steel. More information can be obtained by

CIRCLING 185 ON SERVICE CARD

GLASS REINFORCED PLASTIC TANKS

Jones & Hunt, Inc. reports its new fiberglass plastic tank has a greater strength to weight ratio in compression and tension than steel. The tanks are said to possess outstanding impact resistance, durability and corrosion resistance. Sizes range from 110 gals. to 4,000 gals.

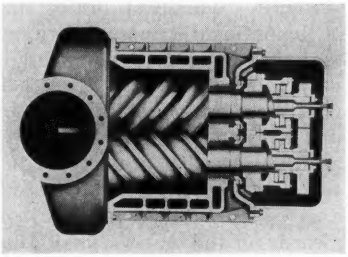
Advantages claimed for the tank are corrosion resistance, no contamination, visible liquid level, low cost, light weight, strength and impact resistance.

A brochure giving full information, including prices and chemical resistance tables, is available.

CIRCLE 186 ON SERVICE CARD

FAIRBANKS-MORSE MAKES NEW ROTARY COMPRESSORS

A new line of positive-displacement rotary compressors is now being manufactured by Fairbanks, Morse & Co. Designed for continuous heavy-duty industrial service handling air, gas or vapor, the



new compressor is expected to have wide application in the process industries for both pressure and vacuum systems including industrial and instrument air, gas and vapor recycling, production of acids and ammonia, aeration and agitation, vapor recovery, etc.

There are five standard cases and impeller sizes, in single-stage and multi-stage units, for pressure, vacuum or booster service. Single-stage capacity runs from a minimum of 800 CFM to a maximum of 13,000 CFM. The two-stage compressors, with external intercoolers, offer compression ratios up to 11 to 1 and can raise a product from atmospheric intake to a maximum discharge pressure of 150 psig. Capacities for the two-stage units range from 2,000 to 13,000 CFM. More information on the line is available.

CIRCLE 187 ON SERVICE CARD

SWIVEL STACKER FOR POWER-CURVE LOADER

A high speed stacking belt used with standard Power-Curve box car and truck loaders makes push-button one-man car loading of bags possible, according to Power-Curve Conveyor Co. The operator guides the bags as the conveyor stacks to full height anywhere in the car.

The stacker and conveyor are push-button controlled from the same station, and advance or retreat under shuttle power without interruption of flow, says Power-Curve. For further information,

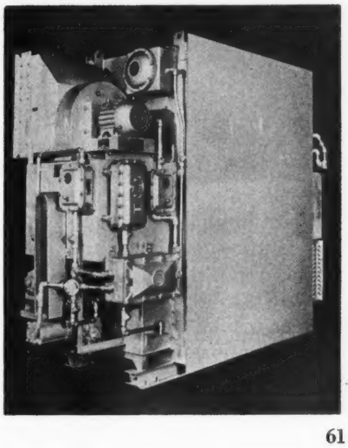
CIRCLE 188 ON SERVICE CARD

DRYOMATIC DEVELOPS LARGE DEHUMIDIFIER

Production of a new dehumidifier, the Model 1500, has been announced by Dryomatic Corp. This machine is the largest in the company's line of commercial and industrial space dryers, and is suitable for moisture control in warehouses and larger commercial storage areas. It also will find application in chemical processing facilities which require a continuous supply of dehydrated air, says Dryomatic Corp.

The new model can remove up to 40 pounds of water per hour and will maintain humidity levels as low as 10 per cent r.h., its manufacturer claims. For details

CIRCLE 189 ON SERVICE CARD



FARM CHEMICALS

Equipment & Supplies

METERING PUMPS FOR THE FERTILIZER INDUSTRY

A newly designed series of continuous-duty metering pumps that transfer liquids and gases through plastic or rubber tubing at exceptionally slow rates with predetermined accuracy have been announced by New Brunswick Scientific Co.

The pumps are ideally suitable as research tools particularly in the fertilizer, feed and milling fields, says the manufacturer, because of their precision control and ability to operate under sterile conditions, plus the range of flow rate (from 2 ml. per day to 75 ml. per minute). For further details,

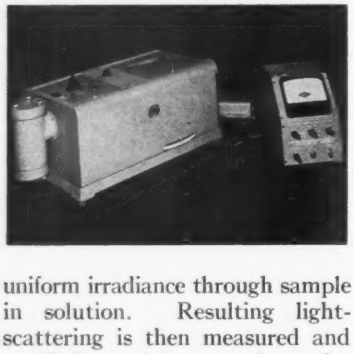
CIRCLE 190 ON SERVICE CARD

NEW PHOTOMETER FROM AMERICAN INSTRUMENT CO.

An Absolute Light-scattering Photometer, said to be remarkably sensitive and accurate, has been introduced by American Instrument Co.

The new photometer permits studies of high-molecular-weight compounds, determination of particle sizes in the micron and submicron ranges and recording of haze and turbidity in moving streams of liquid.

Photometer operation is accomplished by passing a light beam of



uniform irradiance through sample in solution. Resulting light-scattering is then measured and applied to known values for proper evaluation. Complete information is contained in a bulletin available by

CIRCLING 191 ON SERVICE CARD

NPFI CONVENTION (Continued from page 27)

most constructive in which our customers could engage. The use of fertilizer brought the additional net income that was so important to successful operations."

He said there is a trend in Kansas banks to have agricultural representatives.

Rash, in answer to a question, said that his bank had to some extent recommended a bigger loan for more fertilizer. "But," he added, "we try to do it on an indirect basis—not exact recommendations."

At the end of the last general session, Fred C. Scribner, Jr., Under Secretary of the Treasury, warned that "we must be prepared for an even larger deficit in fiscal 1959 than we experienced this year."

He said that "gross national production is down about four per cent and personal income is down about one per cent from this nation's all-time record peaks."

The Economy's Bright Side

Pointing out the optimistic side of the national economy, Scribner said that defense procurement is up 11 billion dollars over last year, steel production is rising, the first five months of 1958 show an all-time record of total construction expenditures for that period, and engineering construction awards for the four weeks of May were up 32 per cent over a year ago.

Dr. Paul D. Sanders, editor of *The Southern Planter*, and Berry H. Akers, editor-in-chief of *The Farmer*, were each presented with the NPFI "Soil Builders Award for Editors" at the annual banquet. There were 34 magazine entries in the six-year-old contest.

Dr. Sanders represented the winner among magazines of more than 300,000 circulation, and W. H. Kircher, managing editor of *The Farmer*, accepted the award to Mr. Akers for magazines of less than 300,000 circulation. Their scrolls read "for superior journalistic contributions toward building of the soils of our nation."

Elections

Richard E. Bennett, president of Farm Fertilizers, Inc., Omaha, Neb., was elected president and L. Dudley George, vice president of Richmond Guano Co., Richmond, Va., chairman of the Board of Directors, at a meeting of the Board of Directors.

Bennett succeeds John A. Miller, president of Price Chemical Co., Inc., and George succeeds C. T. Prindeville, vice president of Swift and Co.

All full-time officers were reelected.

In addition to George and Bennett, members of the executive committee elected by the Board are: John L. Christian, Monsanto Chemical Co.; Ralph B. Douglass, Smith-Douglass Co., Inc.; Dean R. Gidney, United States Potash Co.; Howard A. Parker, Sylacauga Fertilizer Co.; Stanley S. Learned, Phillips Petroleum Co.; W. E. Shelburne, Armour Fertilizer Works; and W. H. Wilson, Virginia-Carolina Chemical Corp.

Mr. Victor A. Ericson was elected to fill the unexpired term on the Board of Directors of Walter E. Meeken, both of Consolidated Rendering Company, and J. C. Crissey, of G.L.F. Soil Building Service was elected to fill the unexpired term of W. T. Steele, Jr., of Richmond, Va.

Twelve new members were elected to the Board of Directors for terms expiring in June 1961. They are: J. H. Epting, Epting Distributing Company; G. R. Monkhouse, Shell Chemical Corporation; Jacob White, Allied Chemical Corporation; R. E. Bennett, Farm Fertilizers, Inc.; S. L. Nevins, Olin Mathieson Chemical Corporation; W. H. Wilson, Virginia-Carolina Chemical Corporation; R. C. Wells, National Potash Company; Rene A. Jones, The Anaconda Company; J. D. Stewart, Jr., Federal Chemical Company; W. E. Shelburne, Armour Fertilizer Works; E. N. Carvel, Valliant Fertilizer Company; and Wallace B. Hicks, Wilson & Toomer Fertilizer Company. ▲

USDA REPORTS ON EPTC EXPERIMENTS

EPTC herbicide may provide more effective and lower cost weed control in strawberries and certain vegetables.

In experiments on weeds in strawberries, USDA researchers have found that over-all sprays of EPTC at the rate of five to ten pounds per acre effectively controlled annual grasses and broadleaved weeds. The spray was applied about a month after setting the strawberry plants, and they were not injured by the herbicide.

Experiments in New Jersey, Maryland and Texas show that an over-all spray of EPTC on tomatoes, following the last cultivation, gave good control of annual grasses and certain broadleaved weeds until tomatoes were harvested. The tomato plants were not injured by the chemical, USDA reported.

Further research is being done with EPTC to determine its practical field use under a wide variety of soil and climatic conditions.

VELSICOL DEVELOPS AND MARKETS EMMI FUNGICIDE

A new eradicative and protective fungicide called EMMI has been developed and is now being marketed by Velsicol Chemical Corp. Chemically, it is N-ethyl-mercuri-1,2,3,6-tetrahydro-3,6,–endomethano–3,4,5,6,7,7–hexachlorophthalimide. Data collected by experiment station personnel in various sections of the country on a wide variety of plants have indicated that the chemical has application as a seed treatment for small grains and cucurbits, and as a foliar spray for pecans. It has been used commercially for several years as a protective dip for gladiolus corms and has obtained federal label acceptance for seed treatment and treatment of gladiolus corms.

Label acceptance also has been granted for the use of EMMI with heptachlor for small grain treatment.

At present, the technical chemical is produced only as an emulsifiable concentrate, which can be diluted in water for application.

Test data and additional information is contained in an information manual, which can be obtained by

CIRCLING 192 ON SERVICE CARD

TESTS WITH DIMETHOATE, A NEW PARASITICIDE

Dimethoate, a new experimental parasiticide, has demonstrated marked efficiency in controlling nasal botflies that attack sheep, according to USDA researchers. The chemical is not yet available to livestock raisers, and its general use has not been recommended.

Injected into the muscles of sheep at a rate of 25 milligrams per kilogram of the animal's weight, the systemic organophosphate compound produced an overall kill of 97 per cent of nose bots (*Oestrus ovis*) in USDA tests.

Dimethoate was discovered by industry chemists and was originally intended for use against cattle grubs. However, USDA said it has not proved as safe or efficient as ET-57 for cattle-grub control.

RED CLOVER BENEFITS FROM MOLY IN CANADA

Benefits to red clover from molybdenum applications were shown in Canadian studies, stated D. K. Robinson in the *Canadian Journal of Plant Science.*

Considerable yield increases on all types of soil tested were reported following dressings of 8 pounds per acre of a molybdenum salt.

Weights and root sizes of all leguminous crop plants tested also were greater, and the application of up to 2,000 lb. per acre of ground limestone did not appear to influence soil responses to molybdenum.

SIX-POUND MATERIALS FOR CUSTOM APPLICATORS

Availability of low volatile six-pound Ethyl Hexyl Esters of 2,4,-D and 2,4,5-T to custom applicators of herbicides has been announced by Diamond Alkali Co.

These high acid equivalent concentrates are said to make possible substantial cost economies and enable custom applicators to reduce on-the-job time and handling costs.

The concentrates may be mixed with water for an emulsion, with straight oil for an oil spray, or with a combination of oil and water.

ANOTHER APPROACH TO WEED CONTROL

In the future, weed control may be largely a matter of "birth control," according to Agronomist R. S. Dunham at the University of Minnesota. He believes chemicals may be developed that will either kill weed seeds on the plant, probably in the fall, or stimulate weed seeds to germinate in the fall so they will be frozen to death during the winter.

Another way, Dunham suggests, might be to prevent weed seed from germinating in the spring by applying chemicals before planting.

TIMING OF INSECTICIDE USE HELPS CONTROL LYGUS BUGS

More effective control of the lygus bug, a costly pest to lima-bean growers, is possible by proper timing of insecticide applications, according to M. W. Stone and Francis B. Foley, USDA entomologists stationed at Whittier, Calif. They reported results obtained in five years of USDA research on lygus-bug control.

Correct timing of insecticidal applications increased yields of dry beans by 200 to 250 pounds per acre, the scientists said. All the experimental treatments reduced the percentage of beans pitted by lygus bugs.

The average results, they said, showed that a single application of DDT, just after blossoming began or about two weeks later when pods appeared, gave the most significant increases in yield.

PEST REPORTS

Presented in cooperation with the Economic Insect Survey Section, Plant Pest Control Branch, Agricultural Research Service. USDA.

'HOPPERS SEVERE IN SEVERAL AREAS

THE grasshopper problem had by June 11, reached outbreak proportions on some 11 million acres in Colorado, Kansas, New Mexico, Oklahoma and Texas. Cooperative programs between the federal government, the states, counties, ranchers and farmers involved, were being organized to combat the pest on rangeland, wasteland, idle land and roadsides in various areas. Farmers in all cases were to treat their own croplands.

In Texas more than 4 million acres of range, idle and waste land in 15 counties were affected. As of the above date, control work had been organized in Dallam, Hansford, Hartley, Hutchinson, Moore, Ochiltree and Sherman Counties with other counties to be organized as soon as possible. Limited damage to the borders of wheat fields had occurred, but due to the nearness of harvest serious loss was not expected. It was anticipated that about 900,000 acres of range and idle land will receive treatment in the Texas panhandle.

Oklahoma reported grasshoppers abundant on more than one million acres of range, idle, and waste land in Beaver, Cimarron, Ellis, Harper, Roger Mills and Texas Counties. Cooperative treatment programs were developed for 120,000 acres in Cimarron and Texas Counties.

In Colorado severe grasshopper conditions were reported from Cheyenne, Kiowa, Kit Carson, Prowers, Yuma and Washington Counties. Counts ranged up to 400 per square yard with some grasshoppers in the adult stage by June 11. Less serious but important infestations were present in 10 other Colorado counties. Over 300,000 acres of rangeland were scheduled for treatment under the federal-state-rancher cooperative program.

The main infestation in Kansas involved an area about 3½ counties wide running from north to south in the western part of the state. Little crop damage had been reported with the infestation still confined largely to roadsides, idle and waste land. As of June 11, plans had been completed to treat 125,000 acres of roadsides and idle land in 17 counties. It was expected nine other counties would enter the program. The New Mexico program involved about 160,000 acres. Only Union County was involved in early June.

In North Dakota the populations were spotty with threatening to severe records in Stark, Golden Valley, Billings and McKenzie Counties. Some damage was occurring to small grains but controls were being applied.

During late May heavy populations of grasshoppers were reported on rangeland in Cuyama Valley, Santa Barbara County, California. First- and second-instar nymphs averaged 70 per square yard in the Beale Air Force Base area of Yuba, Nevada and Placer Counties while heavy populations were also reported from range grass in the Plymouth area of Amador County and at Ukiah, Mendocino County.

In late April the banded wing grasshopper *Trimerotropis pallidipennis* developed in outbreak numbers on large acreages of desert range adjacent to croplands in Pinal and Maricopa Counties, Arizona. Nymphal and adult migrations began when desert grasses dried with advent of warm weather. Damage was especially severe in the Maricopa-Casa Grande-Coolidge area, particularly to sprouting cotton in the immediate paths of migrating bands of nymphs. This same species was heavy in parts of Utah, Nevada and reported from areas of New Mexico.

EUROPEAN CORN BORER

By early June pupation of the European corn borer was complete in the southern and central area of Missouri. Egg laying was underway in the southeast area with 12–16 masses per 100 plants but few corn fields were advanced enough to offer good egg laying conditions.

The first moth at Ankeny, Iowa was taken May 22 and by early June pupation was 90 to 100 percent complete in the central third of the state. Moth flights were on the increase.

Although the overwintering populations were low in Illinois with corn generally ahead of normal, survival could be high with damage heavier than last year.

By early June pupation was 40 percent in south central and southwestern Minnesota and 80 percent in one Sauk County, Wisconsin light soil area but would be later on heavy soil. In Wisconsin it did not appear that the first brood would be very well synchronized with corn growth.

As of the first week in June there was approximately 62 percent pupation in east central South Dakota. In southern Sussex County, Delaware, egg masses were fairly common on small sweet corn plants.

By the last week in May mortality was 27 percent in 89 fields inspected in 12 New Jersey counties with 1.29 borers per stalk. The larval population was less than in 1956 and 1957 and outlook for first-brood generation

... PESTS

was not high except in the Monmouth County, area.

In Alabama all overwintering larvae had pupated and in Indiana no living larvae were found in inspections in 7 counties.

SAY STINK BUG OUTBREAK

In Utah the Say stink bug developed into outbreak proportions by late May and was continuing active in early June. Heavy populations in grain were recorded from Juab, Millard, Washington, Iron, Garfield, Unitah and Utah Counties. The outbreak was considered the worst since 1952 and treatment was necessary on several thousand acres of crops. Arizona reported the insect as being heavy on barley and oats in Graham and Pinal Counties and on oats in Pima County.

BEET LEAFHOPPER MOVEMENT HEAVY IN WEST

The long distance spring movement of the beet leafhopper to the Utah, Nevada and Colorado districts growing sugar beets and tomatoes began May 6 and reached a peak by May 18. From May 21 to 30 another movement occurred which increased the population to 4.7 insects per square foot of beet row. The population in early June was higher than any year since 1926 and damage to non-resistant sugar beets and tomatoes is expected to be serious. In Idaho large migrations of the beet leafhopper appeared in the south central area, evidently borne by southerly winds. In the western end of the Twin Falls irrigated tract populations averaged slightly over 13 per square foot.

POTATO, FLEA BEETLES

The Colorado potato beetle was reported during the period in varying numbers from several states. Pennsylvania, Delaware, Maryland, Virginia, North Carolina, Georgia, Alabama, Louisiana, Colorado, Idaho and Washington all reported the insect as being rather active.

The flea beetle was another vegetable insect with heavy populations in several States. ▲

W. VA. BAG DIV. NAMES TWO REGIONAL MANAGERS

Two regional managers have been named by West Virginia Pulp and Paper Co.'s Multiwall Bag Div. Sheldon Y. Carnes, former vice-president of Arkell and Smiths, will be regional manager with headquarters in New York. Jason M. Elsas, former president of Fulton Bag and Products Co., will be regional manager with headquarters in New Orleans.

Patent Reviews

FC

By Dr. Melvin Nord

NON-BURNING PLANT FERTILIZER

U. S. 2,827,368, issued March 18, 1958 to Everett N. Mortenson and Joseph P. Kealy, assigned to Swift & Co., relates to chemical fertilizers which have little or no "burn" or plasmolysis effect on leafy plants.

This invention is the result of the discovery that the tendency of any given salt to "burn" plant leaves can be correlated with the effect of such salt on the vapor pressure of water. Whether or not a salt will "burn" plant leaves can be readily predicted by simply forming a saturated solution of the particular salt and comparing the vapor pressure of the solution with that of pure water. If the vapor pressure of the solution, as measured on an isoteniscope, is not below a certain level, it can safely be said that the salt will not cause an objectionable plasmolysis effect when applied to leafy plants.

Certain chemical fertilizers "burn" plant leaves, grass in particular, because of an apparent drawing of the moisture from the plant leaves. It has been found that those chemicals or combination of chemicals that exhibit in solution vapor pressures substantially lower than the vapor pressures of plant cell solutions are the ones that cause plasmolysis. This invention contemplates a careful selection of ingredients to formulate high analysis mixed goods which have virtually no deleterious effect when sprinkled on growing leafy plants.

CHELATING AGENTS IN FERTILIZERS

U. S. 2,828,182, issued March 25, 1958 to Nicholas D. Cheronis and Albert Schatz, discloses the use of chelating agents in fertilizers, to increase the rate of soil genesis and soil formation from mineral, rock and soil material by artificially increasing the biological weathering of such material. As a result, potash and other important mineral nutrients are conserved because the plants are enabled to utilize the already present but ordinarily unavailable supply of these materials in the soil.

Those chelating agents which fall into the category of aminopolycarboxylates and polyhydroxycarboxylates are especially useful for this purpose.

PETROLEUM PITCH FERTILIZER DESCRIBED

U. S. 2,829,040, issued April 1, 1958 to John K. Darin and Eldon M. Sutphin, assigned to Gulf Research & Development Co., describes the preparation of a free-flowing fertilizer, in which fertilizer ingredients are disseminated in a finely divided state through a highly expanded, porous, friable, petroleum pitch.

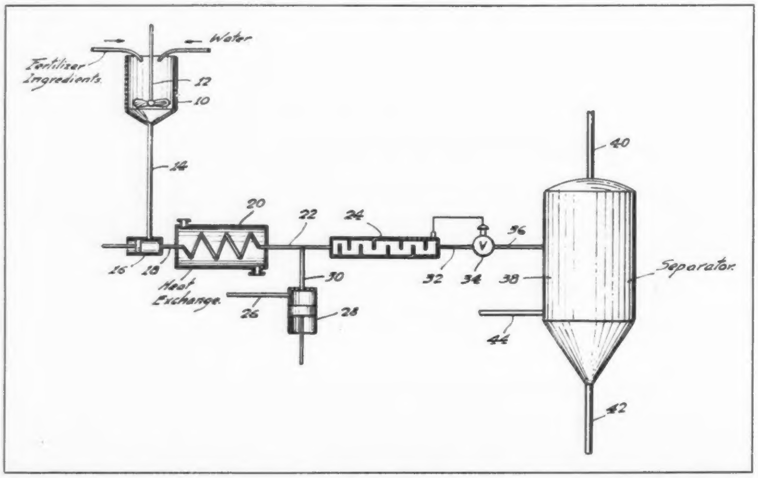
As shown in Fig. 1, a slurry of fertilizer and water is prepared in a mixing tank 10, and is then pumped through a heat exchanger 20, where it is heated to about 400°F. at a pressure of 450–1600 psi. Liquid petroleum pitch at 500–800°F. is delivered by pump 28, along with the heated fertilizer slurry, to a mixer 24, provided with baffles, thereby forming a uniform dispersion.

The dispersion is discharged, through a pressure control valve 34, into a separator 38, which is maintained at about 25 psig.

The reduction in pressure causes flashing of water in the mixture to steam and a rapid drop in the temperature as the unvaporized materials give up heat for the vaporization. The greatly increased volume resulting from the flashing of the water causes the product to travel through nozzle 36 at a high velocity and in a highly turbulent state. Upon discharge into the separator, the water vapor is separated from the solidified fertilizer particles and discharged overhead through vent 40. The fertilizer particles drop to the bottom of the separator 38 and are removed therefrom through line 42. Air may be blown into the separator 38 through line 44 to cool the fertilizer product.

The fertilizer ingredients in the novel fertilizer are disseminated uniformly throughout the highly porous pitch. The pitch thus provides an extremely thin waterproof coating over many of the surfaces of the particles of the fertilizer ingredients. The highly porous and brittle nature of the fertilizer results in easy fracture of the fertilizer particles to expose new surfaces of the fertilizer ingredients. Thus, the pitch prevents rapid leaching of the fertilizer ingredients, but does not provide an unbreakable waterproof coating of substantial thickness which makes the fertilizer ingredients substantially completely unavailable to the plants. The pitch covers the surfaces of

Figure 1.



the fertilizer ingredients adequately to prevent the fertilizer becoming sticky or caking during storage.

CONDITIONING AND FERTILIZING

U. S. 2,826,002, issued March 11, 1958 to Leo J. Novak and Everette E. Witt, and assigned to The Commonwealth Engineering Co. of Ohio, discloses dextran compositions for simultaneously fertilizing and modifying the physical structure of soil.

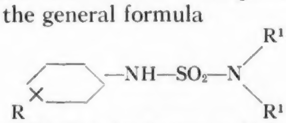
BENEFICIATION OF PHOSPHATE ORES

U. S. 2,826,301, issued March 11, 1958 to Ira M. Le Baron and assigned to International Minerals & Chemical Corp., provides an improvement in the beneficiation of phosphatic ores through minimizing the effect of slimes while at the same time improving the aeration of the pulp particles subjected to flotation, thus aiding in raising the flotation product to the surface.

HERBICIDE PREPARATION

U. S. 2,829,038, issued April 1, 1958 to Paul Ochsner, assigned to Union Chimique Belge, S.A., discloses the preparation of weed killers.

These products contain aromatic sulfamides corresponding to the general formula



in which R is hydrogen or halogen atom or a lower aliphatic radical; R^1 is a lower aliphatic radical.

The aromatic sulfamides are obtained by reacting a sulfamyl halide with an aniline or a substituted aniline. The products so prepared act as selective weedkillers.

PRODUCTION OF N AND H FOR AMMONIA SYNTHESIS

U. S. 2,829,113, issued April 1, 1958 to Martin J. Barry and Theodore S. Williams, assigned to The M. W. Kellogg Co., describes a process for making hydrogen from natural gas, for use in the synthesis of ammonia.

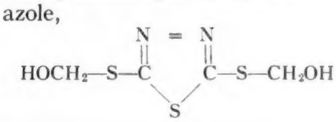
By means of this invention, a process is contemplated which comprises contacting a carbon monoxide containing gas with a series of catalyst beds at an elevated temperature and injecting water between the beds in order to regulate the reaction temperature at which the carbon monoxide is reacted with steam to produce hydrogen by means of the water gas shift reaction. The water employed for the injection between the catalyst beds is in a liquid condition. This feature is particularly desirable, because it makes possible the employment of smaller quantities of water by virtue of the quantity of heat which can be absorbed in vaporizing the water to a gaseous state. Furthermore, the injection of water between catalyst beds can serve as a means of furnishing water for the reaction between carbon monoxide and steam.

Fig. 2 shows a schematic flowsheet of the process.

DEFOLIATING COMPOSITION

U. S. 2,829,037, issued April 1, 1958 to Heinz Pohlemann, Hans Krzikalla, Oscar Flieg, and Carl Pfaff, and assigned to Badische Anilin-&Soda-Fabrik A.G., describes defoliating compositions, for use in the harvesting of cotton.

The chief ingredient is 2,5-dimethylolmercapto-1, 3, 4-thiodiazole,



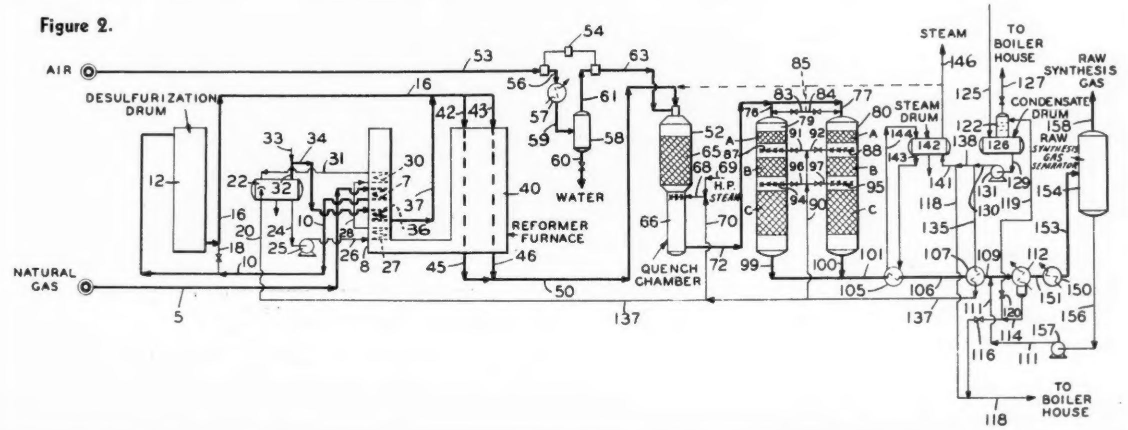
PLANT GROWTH REGULANTS HERBICIDES, INSECTICIDE

U. S. 2,828,198, issued March 25, 1958 to Walter D. Harris and Albert W. Feldman, assigned to United States Rubber Co., discloses the use of poly (chlorophenoxyethyl) phosphites as plant growth regulants and herbicides.

These compounds are prepared by reacting one mole of phosphorus trichloride with three moles of the selected chlorophenoxyethanol, preferably in an inert solvent such as benzene, thus forming the bis-phosphites. By using an equivalent amount of a tertiary amine acid acceptor such as pyridine or dimethylaniline, the tris-phosphites are formed.

U. S. 2,828,241, issued March 25, 1958 to Gail H. Birum, and assigned to Monsanto Chemical Co., discloses the use as plant spray insecticides of the arylmercapto esters of certain phosphoric acids, e.g. O,O-diethyl S-(4-chlorophenylmercapto) phosphorothionate.

Figure 2.



Fertilizer Materials Market

New York

June 20, 1958

Sulfate of Ammonia. Most producers such as coke oven people are continuing the same price schedule for the new season which is $32 per ton in bulk, f. o. b. production points. One synthetic producer has advanced their price $1 per ton for the new season.

Ammonium Nitrate. Producers are offering seasonal discounts for summer shipments with the hope of getting some buyers to take the material into their plants earlier than usual.

Nitrogen Solutions. Most producers are offering seasonal discounts for early summer delivery. Demand has been excellent because of the shortage in some sections of sulfate of ammonia.

Nitrogenous Tankage. This material is rather scarce as production has been cut down both in this country and abroad for lack of raw material. The market today is about $4 to $4.75 per unit of ammonia ($4.86 to $5.77 per unit N) and some producers are sold out for the coming year.

Castor Pomace. The domestic market is about $36 per ton, f. o. b. production points, with some imported material scheduled to arrive at Southern ports. Demand has been fairly good recently because of the shortage of nitrogenous tankage.

Organics. Trading picked up in organic fertilizer materials as demand from both the fertilizer and feed trade recently increased. Blood sold at $6.50 per unit of ammonia ($7.90 per unit N) f. o. b. Eastern points and tankage sold at $6.75 per unit of ammonia ($8.20 per unit N) f. o. b. New York. Soybean advanced about $4 per ton in the last week and was quoted at $59 per ton f. o. b. Decatur, Ill. in bulk. Cottonseed meal was fairly scarce as most of the old crop material has been cleaned up with last sales at $61 per ton, f. o. b. Memphis, Tenn. Linseed meal was tight for immediate shipment because of the short crop of linseed the past year.

Fish Meal. With fishing operations under way in many sections, offerings were a little more plentiful with last sales of menhaden fish meal on the basis of $133 per ton, f. o. b. fish factories. Some imported material continued to arrive from time to time.

Bone Meal. This material is steady at $65 per ton, f. o. b. Eastern shipping points. Demand has been fairly good and producers are entering the dull season with little inventory. Feeding bone meal from abroad continues to arrive at various ports at prices ranging from $65 to $70 per ton.

Hoof Meal. A steady demand has been maintained for hoof meal at $6.25 per unit of ammonia ($7.59 per unit N) f. o. b. Chicago, with producers well sold ahead at this figure.

Superphosphate. Prices continue to hold steady at most Eastern points and buyers only are taking delivery as needed.

Potash. Producers continue to revise schedules and name lower prices and it is hard to say just what the market is. So far prices are about 32 cents per unit for muriate of potash, f. o. b. Carlsbad, New Mexico which is subject to seasonal discounts. Buyers are a bit confused and some are holding off placing their orders until the market settles down.

Philadelphia

June 20, 1958

Conditions in the raw materials market are more or less normal, with chemical materials in ample supply. Organics, however, are somewhat behind the demand.

Sulfate of Ammonia. The granular grade is being advanced to $35 per ton, but coke-oven is still being quoted at $32. Supply is ample.

Ammonium Nitrate. While stocks are still sufficient to meet all requirements, inventories have been reduced materially. New price seems to be $70 per ton, less seasonal discounts for early deliveries. This makes August shipment $65 per ton, advancing $1 per ton per month to $69 December: and $70 per ton thereafter.

Nitrate of Soda. No developments of interest, and prices remain unchanged.

Urea. This material continues to be listed at $110 per ton for the 45 per cent Nitrogen grade.

Blood, Bone, Tankage. Bone Meal continues at $65 per ton. Blood is currently listed at $6.50 per unit ammonia ($7.90 per unit N) New York area, and $6.75 ($8.20 per unit N) Chicago. Animal tankage is priced at $6.50 per unit ($7.90 per unit N) New York, and $7.25 ($8.82 per unit N) per unit Chicago. There is no nitrogenous tankage offering at this time. The material is extremely scarce.

Castor Pomace. This is still nominal at $40 per ton, with no transactions reported.

Fish Scrap. Supply is quite limited and prices are $129 per ton for scrap, while menhaden meal is offered at $133 per ton.

Superphosphate. Inquiry is rather moderate with supply well able to meet demand. Prices are still listed at 90 cents to 93 cents per unit A. P. A. for normal grade, and 98 cents per unit for triple superphosphate.

Potash. New price lists have been posted indicating 32 cents to 34 cents per unit K_2O per ton of muriate depending upon time of shipment—July to December. There is no scarcity of material reported at this time.

Los Angeles

June 5, 1958

Sulfate of Ammonia. Moving steadily, with ample stocks on hand at $48 bulk and $52 bagged.

Ammonium Nitrate. Demand fair, at $84 per ton delivered by rail or truck.

Urea. Demand has slackened slightly. Price remains at $113.50 per ton delivered for both the 45 per cent and 46 per cent.

Blood Meal. Strong current demand, with most sales at $7.50 per unit of ammonia ($9.12 per unit N)

Tankage. Most producers have booked production for 30 days ahead at $6 per unit of ammonia ($7.30 per unit N)

Meat Meal. Currently quoted at $2.25 per unit of protein ($112.50 per ton.)

Fish Meal. Asking $2.25 per unit of protein ($146.25 per ton), off 5 cents per unit, in order to equalize with meat meal.

Potash. Sales have been disappointing so far this year, so ample supplies are on hand

SAFETY CONTEST RESULTS ANNOUNCED BY COUNCIL

Of the 175 contestants which completed the National Safety Council's 1957 Fertilizer Section Safety Contest, 80 had perfect records at the end of 12 months.

Total number of manhours worked by contestants was 29,175,000, four per cent less than reported in 1956. The 319 injuries which occurred were 1 per cent less than in 1956.

FERTILIZER CONTEST SUMMARY

Division	Jan.-Dec. Freq. Rate	% Change from Jan.-Dec. 1956
All Divisions	10.93	+3%
Div. I (Dry Mix Units)	11.86	+11%
Div. II (Wet Mix Units)	12.75	−20%
Div. III (Fertilizer plants)	13.48	0
Div. IV (Open Pit)	6.62	+53%

In the Chemical Division Safety Contest, 286 of the 764 contestants had perfect records at the end of 12 months. Injuries decreased 2 per cent from 1956. There were 2,626 injuries in 801,711,000 manhours worked in the 1957 contest.

Alphabetical List of Advertisers

Buyers' Guide

Classified Index to Advertisers in 'Farm Chemicals'

ALDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.

AMMONIA—Anhydrous and Liquor
Allied Chemical Corp., Nitrogen Div., N.Y.C.
American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
E. I. duPont de Nemours & Co., Wilmington, Del.
Escambia Chem. Corp., Pensacola, Fla.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Chicago, Ill.
Sohio Chemical Co., Lima, O.
The Texas Co., New York City

AMMONIUM NITRATE
American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
Escambia Chem. Corp., Pensacola, Fla.
Monsanto Chem. Co., St. Louis, Mo.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.

AMMONIUM SULFATE
See Sulfate of Ammonia

BAGS—BURLAP
Chase Bag Co., Chicago, Ill.

BAGS—COTTON
Chase Bag Co., Chicago, Ill.

BAGS—Multiwall-Paper
Chase Bag Co., Chicago, Ill.
Kraft Bag Corporation, New York City
Raymond Bag Corp., Middletown, Ohio
Union Bag—Camp Paper Corp., New York City
West Virginia Pulp and Paper Co., New York City

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.

BAG PRINTING MACHINES
Schmutz Mfg., Louisville, Ky.

BAG CLOSING MACHINES
Dave Fischbein Co., Minneapolis, Minn.
International Paper Co., New York City

BAG FILLING MACHINES
Chase Bag Co., Chicago, Ill.
E. D. Coddington Mfg. Co., Milwaukee, Wisc.
Kraft Bag Corporation, New York City
Stedman Foundry and Machine Co., Aurora, Ind.
Union Bag—Camp Paper Corp., New York City

BHC AND LINDANE
Ashcraft-Wilkinson Co., Atlanta, Ga.

BONE PRODUCTS
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash & Chemical Corp., Los Angeles, California
Woodward & Dickerson, Inc., Philadelphia, Pa.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BULK TRANSPORTS
Baughman Mfg. Co., Jerseyville, Ill.

CALCIUM ARSENATE
American Agricultural Chemical Co., N. Y. C.

CARS AND CARTS
Stedman Foundry and Machine Co., Aurora, Ind.

CASTOR POMACE
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.

CHEMISTS AND ASSAYERS
Shuey & Co., Inc., Savannah, Ga.

CHLOROBENZILATE
Geigy Agr. Chems. Div. Geigy Chem. Corp. N.Y.C.

CHLORDANE
Ashcraft-Wilkinson Co., Atlanta, Ga.
Velsicol Chemical Corp., Chicago, Ill.

CLAY
Ashcraft-Wilkinson Co., Atlanta, Ga.
Thomas Alabama Kaolin Co., Baltimore, Md.

CONDITIONERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., New York City
Jackle, Frank R., New York City
Keim, Samuel D., Philadelphia, Pa.
U. S. Graphite Co., Saginaw, Mich.

CONVEYORS
Baughman Mfg. Co., Jerseyville, Ill.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

COPPER SULFATE
Tennessee Corp., Atlanta, Ga.
Republic Chemical Corp., New York City

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

DDT
Ashcraft-Wilkinson Co., Atlanta, Ga.
Geigy Agr. Chems., Geigy Chem. Corp., N.Y.C.

DIAZINON
Geigy Agr. Chems. Geigy Chem. Corp., N.Y.C.

DIELDRIN
Ashcraft-Wilkinson Co., Atlanta, Ga.

DILUENTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Johns-Manville Corp., New York City

DRUMS—STEEL
Vulcan Containers, Inc., Bellwood, Ill.
Vulcan Steel Container Co., Birmingham, Ala.

DUST CONTROL
Johnson-March, Philadelphia, Pa.

DUST MASKS
Flexo Products, Inc., Westlake, Ohio

ELEVATORS
Stedman Foundry and Machine Co., Aurora, Ind.

EMULSIFIERS
Emulsol Chemical Corp., Chicago, Ill.

ENDRIN
Velsicol Chemical Corp., Chicago, Ill.

ENGINEERS—Chemical and Industrial
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

FERTILIZER—Liquid
Clover Chemical Co., Pittsburgh, Pa.

FERTILIZER—MIXED
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
International Min. & Chem. Corp., Chicago, Ill.
International Ore & Fertilizer Corp., New York City
Plant Food Corp., Los Angeles, Calif.

FILLERS
Bradley & Baker, N. Y. C.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

FULLER'S EARTH
Ashcraft-Wilkinson Co., Atlanta, Ga.

FUNGICIDES
American Agricultural Chemical Co., N. Y. C.
Tennessee Corp., Atlanta, Ga.

HEPTACHLOR
Velsicol Chemical Corp., Chicago, Ill.

HERBICIDES
American Cyanamid Co., New York City
American Potash & Chemical Corp., Los Angeles, California

HOPPERS & SPOUTS
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

KAOLIN
Thomas Alabama Kaolin Co., Baltimore, Md.

INSECT REPELLENT
Glenn Chemical Co., Inc., Chicago, Ill.

INSECTICIDES
American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., Atlanta, Ga.
Geigy Agr. Chems., Div. Geigy Chem. Corp. N. Y. C.
International Ore & Fertilizer Corp., New York City
Plant Food Corp., Los Angeles, Calif.
Velsicol Chemical Corp., Chicago, Ill.

IRON CHELATES
Geigy Agr. Chems., Div. Geigy Chem. Corp. N. Y. C.
Tennessee Corp., Atlanta, Ga.

IRON SULFATE
Tennessee Corp., Atlanta, Ga.

LEAD ARSENATE
American Agricultural Chemical Co., N. Y. C.

LIMESTONE
American Agricultural Chemical Co., N.Y.C.
Ashcraft-Wilkinson Co., Atlanta, Ga.

MACHINERY—Acid Making and Handling
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Acidulating
Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY—Grinding and Pulverizing
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

Buyers' Guide

MACHINERY—Material Handling

Clark Equipt. Co., Construction Mach. Div., Benton Harbor, Mich.
Hough, The Frank G. Co., Libertyville, Ill.
Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.
Tractomotive Corp., Deerfield, Ill.

MACHINERY—Mixing and Blending

Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Mixing,ScreeningandBagging

Poulsen Co., Los Angeles, Calif.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Power Transmission

Stedman Foundry and Machine Co., Aurora, Ind.

MACHINERY
Superphosphate Manufacturing

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MALATHION

American Cyanamid Co., New York City

MANGANESE SULFATE

Tennessee Corp., Atlanta, Ga.

MANURE SALTS

Potash Co. of America, Washington, D. C.

METHOXYCHLOR

Geigy Agr. Chems., Div. Geigy Chem. Corp. N.Y.C.

MINOR ELEMENTS

Geigy Agr. Chems., Div. Geigy Chem. Corp. N.Y.C.
Tennessee Corporation, Atlanta, Ga.

MIXERS

Rapids Machinery Co., Marion, Iowa.
Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

NITRATE OF SODA

Allied Chemical Corp., Nitrogen Div., N.Y.C.
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NITROGEN SOLUTIONS

Allied Chemical Corp., Nitrogen Div., N. Y. C.
American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Commercial Solvents Corporation, New York City
E. I. duPont de Nemours & Co., Wilmington, Del.
Escambia Chem. Corp., Pensacola, Fla.
Mississippi River Chem. Co., St. Louis, Mo.
Phillips Chemical Co., Bartlesville, Okla.
Sinclair Chemicals, Chicago, Ill.
Sohio Chemical Co., Lima, O.
The Texas Co., New York City

NITROGEN MATERIALS—Organic

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray

Monarch Mfg. Works, Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

PAILS—STEEL

Vulcan Containers, Inc., Bellwood, Ill.
Vulcan Steel Container Co., Birmingham, Ala.

PARATHION

American Cyanamid Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.

PHOSPHATE ROCK

American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co, Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
International Ore & Fertilizer Corp., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

PHOSPHORIC ACID

American Agricultural Chemical Co., N. Y. C.
Allied Chemical Corp., General Chemical Div., N. Y. C.

PLANT CONSTRUCTION—Fertilizer and Acid

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

POTASH—Muriate

American Potash & Chemical Corp., Los Angeles, California
Ashcraft-Wilkinson Co., (Duval Potash) Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bonneville, Ltd., Salt Lake City, Utah.
Bradley & Baker, N. Y. C.
Duval Sulphur & Potash Co., Houston, Tex.
International Min. & Chem. Corp., Chicago, Ill.
National Potash Co., New York City
Potash Co. of America, Washington, D. C.
Southwest Potash Corp., New York City
United States Potash Co., N. Y. C.

POTASH—Sulfate

American Potash & Chemical Corp., Los Angeles, California
International Min. & Chem. Corp., Chicago, Ill.
Potash Co. of America, Washington, D. C.

PRINTING PRESSES—Bag

Schmutz Mfg. Co., Louisville, Ky.

PYROPHYLLITE

Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS

Stedman Foundry and Machine Co., Aurora, Ind.

SCALES -Including Automatic Baggers

Stedman Foundry and Machine Co., Aurora, Ind.

SCREENS

Stedman Foundry and Machine Co., Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

SCRUBBERS

Johnson-March, Philadelphia, Pa.

SOLVENTS

Richfield Oil Corp., Los Angeles, Calif.

SHOVEL LOADERS

Clark Equipt. Co., Benton Harbor, Mich.
Hough, The Frank G. Co., Libertyville, Ill.
Tractomotive Corp., Deerfield, Ill.

SLUDGE

H. J. Baker & Bro., New York City

SPRAYS

Baughman Mfg. Co., Jerseyville, Ill.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Spraying Systems Co., Bellwood, Ill.

SPREADERS, TRUCK

Baughman Manufacturing Co., Jerseyville, Ill.

STORAGE TANKS

Cole, R. D., Manufacturing Co., Newman, Ga.

SULFATE OF AMMONIA

Allied Chemical Corp., Nitrogen Div., N. Y. C.
American Agricultural Chemical Co., N. Y. C.
American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
Jackle, Frank R., New York City
Phillips Chemical Co., Bartlesville, Okla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFATE OF POTASH—MAGNESIA

International Min. & Chem. Corp., Chicago, Ill.

SULFUR

Ashcraft-Wilkinson Co., Atlanta, Ga.
Texas Gulf Sulphur Co., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULFUR—Dusting & Spraying

Ashcraft-Wilkinson Co., Atlanta, Ga.
U.S. Phosphoric Products Div., Tennessee Corp., Tampa, Fla.

SULFURIC ACID

Allied Chemical Corp. General Chemical Div., N. Y. C.
American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
International Ore & Fertilizer Corp., New York City
Tennessee Corp., Atlanta, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SUPERPHOSPHATE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SUPERPHOSPHATE—Concentrated

American Cyanamid Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Phillips Chemical Co., Bartlesville, Okla.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Woodward & Dickerson, Inc., Philadelphia, Pa.

TALC

Ashcraft-Wilkinson Co., Atlanta, Ga.

TANKAGE

American Agricultural Chemical Co., N. Y. C.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
International Min. & Chem. Corp., Chicago, Ill.
Jackle, Frank R., New York City
Woodward & Dickerson, Inc., Philadelphia, Pa.

TANKS—NH3 and Liquid N

Cole, R. D., Manufacturing Co., Newman, Ga.

TOXAPHENE

Ashcraft-Wilkinson Co., Atlanta, Ga.

TRUCKS—SPREADER

Baughman Mfg. Co., Jerseyville, Ill.

UREA & UREA PRODUCTS

Allied Chemical Corp., Nitrogen Div., N. Y. C.
H. J. Baker & Bro., N. Y. C.
Bradley & Baker, N. Y. C.
E. I. duPont de Nemours & Co., Wilmington, Del.
Grand River Chem. Div., Deere & Co., Tulsa, Okla.
Sohio Chemical Co., Lima, O.

UREA-FORM

E. I. duPont de Nemours & Co., Wilmington, Del.

VALVES

Monarch Mfg. Works, Inc., Philadelphia, Pa.

ZINC SULFATE

Tennessee Corp., Atlanta, Ga.

CALS

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